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Bradbury's NEW Elementary ARITHMETIC

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Bradbury's Eaton's Mathematical Series.

BRADBURY'S

NEW

ELEMENTARY ARITHMETIC;

COMPRISING

ORAL AND WRITTEN WORK.

BY

WILLIAM F. BRADBURY,

HEAD MASTER OF THE CAMBRIDGE LATIN SCHOOL, AUTHOR OF A SERIES OF ARITHMETICS, ETC.

REVISED EDITION.

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PREFACE.

THIS book is now presented in a revised and enlarged form in answer to the increasing demand for more arithmetical work in the Intermediate or lower Grammar school classes.

Though the plan remains the same, a large number of examples have been added in the different subjects, and the work has been made more complete by giving models in script type for bills, orders, notes, drafts, etc.

Oral and written work has been combined throughout the book.

Small numbers have been selected for the exercises, and great care has been taken to have everything clearly stated and the work progressive. Decimals as far as thousandths, the place of mills in United States currency, are introduced at the beginning with integral numbers.

Very few rules are given, and abstract explanations of principles are generally omitted. The essential subjects, with the applications most useful in the business of every-day life, have been selected for treatment, and the methods adopted are those in actual use among business men. Only such tables of compound numbers have been given as are used in ordinary transactions.

The book will meet the wants of those pupils who are obliged to leave school before taking up a larger work, and will serve as an introduction to Bradbury's Practical Arithmetic.

SUGGESTIONS TO TEACHERS.

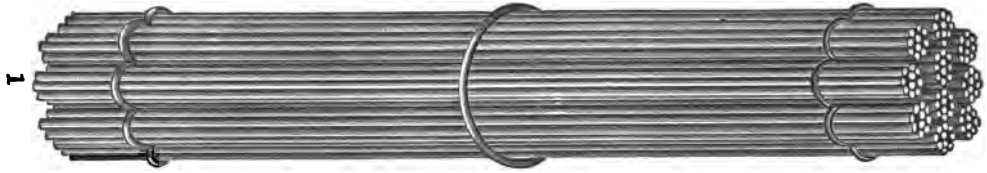
In the belief that *written* explanations are as likely to be a stumbling-block as an aid to the pupils for whom the Elementary Arithmetic is intended, many points have been left without explanation. In such cases it is expected that the teacher will introduce the explanation at such points in the pupil's progress, and to such an extent, as the teacher may deem best. *Accurate work* is what practical life requires; but accurate work (except, perhaps, when such work is merely mechanical) is most surely attained by a thorough understanding of the principles and the processes involved. The explanations that are given are designed as a guide to the teacher fully as much as to the pupil, and at the discretion of the teacher may be omitted by the pupil, or deferred to a later point.

The method given of casting interest is the one used by business men, and is the simplest as well as the most expeditious. Facility in its application can best be gained by actual practice. To this end the teacher should introduce as many additional examples as time will allow.

A large number of examples have been added at the end of the book. These will be valuable for additional work and for review.

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Hundred.



Ten.



Unit.



Tenth.



Hundredth.

ELEMENTARY ARITHMETIC.

NOTATION AND NUMERATION.

1. A **Unit** is a single thing of any kind; as, one apple, one book.

2. A **Number** is a unit, or a collection of units; as, six apples, ten books.

3. **Notation** is the writing of numbers.

4. **Numeration** is the reading of numbers.

5. To express numbers ten figures are used, viz.:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Zero, One, Two, Three, Four, Five, Six, Seven, Eight, Nine.

The first figure is called *zero*, a *cipher*, or *naught;* standing alone, it signifies *nothing*. The remaining nine figures represent in order the numbers one, two, three, four, five, six, seven, eight, nine.

1. How many units are there in five? in seven? in nine?
2. Write in figures, three; five; eight; nine.

No number greater than *nine* can be expressed by a single figure, but by uniting the ten characters in various order, all numbers can be expressed. Thus,

Twelve	in figures is	12
Fifteen	"	15
Eighteen	"	18
Twenty	"	20
Thirty-five	"	35
Seventy-seven	"	77

6. Read the following numbers:

3. 11	6. 27	9. 52	12. 81
4. 13	7. 38	10. 64	13. 89
5. 19	8. 43	11. 75	14. 96

7. Express in figures:

15. Seventeen.	20. Sixty-five.
16. Twenty-one.	21. Seventy.
17. Thirty-seven.	22. Eighty-eight.
18. Forty-two.	23. Ninety-four.
19. Fifty-nine.	24. Ninety-eight.

One hundred	in figures is	100
One hundred four	"	104
One hundred thirty-eight	"	138
Two hundred three	"	203
Two hundred seventy-seven	"	277

8. Read the following numbers:

25. 107	28. 129	31. 256	34. 567	37. 891
26. 111	29. 134	32. 365	35. 657	38. 918
27. 119	30. 142	33. 416	36. 765	39. 981

9. Express in figures:

40. One hundred ten; fifty-four.
41. Two hundred; two hundred twenty.
42. Eighty-four; six hundred seventy.
43. Three hundred sixty-seven; ninety-seven.
44. Four hundred one; eight hundred six.
45. Six hundred forty-seven; two hundred.
46. Nine hundred eighty-three; seven hundred three.
47. Nine hundred four; five hundred nine.

One thousand	in figures is	1 000
One thousand seven	"	1 007
Two thousand ten	"	2 010
Three thousand forty-five	"	3 045
Four thousand four hundred four	"	4 404

10. Read the following numbers:

48. 1 070	52. 4 567	56. 6 051	60. 7 201
49. 2 600	53. 4 602	57. 6 111	61. 8 765
50. 3 055	54. 5 270	58. 6 207	62. 9 208
51. 3 512	55. 5 601	59. 7 021	63. 9 999

11. To determine the value of a number expressed in figures, two things must be considered: first, *how many* units each figure represents; and, second, the place of each figure. Thus, in each of the numbers 3, 30, 300, the left-hand figure is three; but in the first it represents three units; in the second, three tens; and in the third, three hundreds.

It is therefore evident that a figure is made to represent units of tenfold value by removing it one place to the left; a hundred fold by removing it two places, etc. The *cipher*, when used with other figures, fills a place that would otherwise be vacant; thus, in 206 the cipher occupies the place of *tens*, because there are *no tens* in the given number.

12. Express in figures:

64. One thousand ten; one thousand five.
65. Two thousand twenty; three thousand seven.
66. Three thousand thirty; seven thousand nine.
67. Five thousand five hundred five.
68. Seven thousand six hundred fifty-four.
69. Nine thousand seven hundred five.

Twenty thousand in figures is 20 000
Fifty-three thousand four hundred in figures is 53 400
Seventy-five thousand forty in figures is 75 040
Three hundred six thousand thirty-two in figures is 306 032
Six hundred sixty thousand six hundred six in figures is 660 606

13. Read the following numbers:

70. 30 705	74. 101 010	78. 456 789
71. 42 137	75. 130 303	79. 523 007
72. 70 880	76. 217 040	80. 606 710
73. 85 403	77. 395 421	81. 813 507

14. Express in figures:

82. Fourteen thousand sixty-five.
83. Thirty-seven thousand five hundred five.
84. Fifty thousand forty-eight.
85. One hundred fourteen thousand six hundred fifty-five.
86. Three hundred four thousand five hundred forty-two.
87. Seven hundred seven thousand seventy.
88. Nine hundred sixty-nine thousand eight hundred thirty-four.

15. Figures can also be written on the right of the unit figure. Figures thus written, if separated from the unit figure by a point, are called *decimals*, and the point is called the decimal point. Thus,

2.4 is 2 units, and 4 tenths,
3.08 is three units, and 8 hundredths,
0.005 is 5 thousandths,
0.023 is 23 thousandths,
0.167 is 167 thousandths,
0.94 is 94 hundredths.

16. Read the following numbers:

89.	3.5	92.	2.08	95.	13.41	98.	10.01
90.	2.18	93.	4.161	96.	3.041	99.	8.004
91.	0.31	94.	5.007	97.	8.503	100.	16.17

17. Express in figures:

101. Four, and four tenths; five, and two tenths.
102. Fourteen hundredths; sixty-one hundredths.
103. Five hundred thirty-two thousandths.
104. Sixteen, and sixteen thousandths.
105. Eighty, and eight hundredths.
106. Ninety-four, and seventy-five hundredths.

18. The following table shows the method of writing numbers and the names of the places.

NUMERATION TABLE.

Millions,	Hundred Thousands, Ten Thousands, Thousands,	Hundreds, Tens, Units.	Tenths, Hundredths, Thousandths.
6	0 0 1	8 4 3 .	5 4 8

For convenience in reading, figures are often separated into periods of three figures, as shown in the

table. The first period on the right of the decimal point contains tenths, hundredths, and thousandths, and is called the *thousandths'* period; the first period at the left of the decimal point contains units, tens, and hundreds, and is called the *units'* period; the second period contains thousands, ten thousands, and hundred thousands, and is called the *thousands'* period; and so on as shown in the table.

NOTE. Where there are no decimal figures the decimal point is usually omitted. To avoid ambiguity in writing in words and in reading a decimal we shall use the conjunction *and* in such cases only between the unit and the decimal. Thus, 0.203 is not two hundred *and* three thousandths, but two hundred three thousandths; and 200.003 is two hundred, and three thousandths.

EXERCISES.

19. Read the following numbers:

107.	2.2	112.	875 321.6
108.	27.34	113.	404 004.04
109.	405.06	114.	200 409.17
110.	3 307	115.	2 786 321
111.	45 052	116.	7 050 402

20. Write the following numbers in figures:

117. Forty-seven.
118. Seventeen.
119. Sixty-five.
120. Ninety.
121. Two hundred three, and four tenths.
122. Five hundred seventy, and five hundredths.
123. Nine hundred nine, and nine hundredths.
124. Two thousand, and two thousandths.
125. Five thousand three, and four hundredths.
126. Thirty thousand seven hundred, and five tenths.
127. Three millions two hundred, and nine tenths.
128. Seventy thousand five hundred four, and seven hundredths.

$$\begin{array}{r} 3 + 2 = 5 \\ 4 + 7 = 11 \\ \hline 7 + 9 = 16 \end{array}$$

ADDITION.

21. ORAL EXERCISES.

1. John gave me 7 cents and James gave me 12 cents. How many did both give me?

2. I gave to William 8 marbles, to Charles 5, and to Albert 6. How many marbles did I give to the three boys?

3. Mary paid 12 cents for writing-paper, 4 cents for a lead-pencil, and had 8 cents left. How many cents had she at first?

4. Mr. Abbott paid 7 dollars for a pair of boots, and 37 dollars for an overcoat. How much did he pay in all?

5. A man paid 45 dollars for a stove, and 9 dollars for wood. How much did he pay for both?

6. Paid 7 dollars for a ton of coal, 6 dollars for a barrel of flour, and 5 dollars for a cord of wood. How much did I pay in all?

7. George walked 7 miles Monday, 8 miles Tuesday, 9 miles Wednesday, and 10 miles Thursday. How many miles did he walk in these four days?

8. William earned 4 dollars in January, 6 dollars in February, 9 dollars in March, and 5 dollars in April. How much did he earn in these four months?

9. How many are 8 and 5? 18 and 5? 28 and 5? 38 and 5? 48 and 5? 58 and 5? 68 and 5? 78 and 5? 88 and 5? 98 and 5?

10. How many are 13 and 8? 23 and 8? 33 and 8? 43 and 8? 53 and 8? 63 and 8? 73 and 8? 83 and 8? 93 and 8?

11. How many are 27 and 9? 37 and 9? 47 and 9? 57 and 9? 67 and 9? 97 and 9?

12. Count by fours from 47 to 107. Count by fives from 53 to 103.

22. The *sum* or *amount* of two or more numbers is a number which contains the same number of units as the two or more numbers together; thus, 5 is the sum of 2 and 3, because there are just as many units in 5 as in 2 and 3 together; for a like reason 10 *cents* is the sum of 1 cent, 3 cents, and 6 cents.

23. *Only numbers of the same kind can be added;* thus, 2 marbles and 3 marbles are 5 marbles; but 2 oranges and 3 marbles are neither 5 oranges nor 5 marbles.

24. **Addition** is the process of finding the sum of two or more numbers of the same kind.

25. A **Sign** is a mark which indicates an operation to be performed, or which is used to shorten some expression. Thus,

Instead of writing 3 *and* 5, we can write 3 + 5, read 3 *plus* 5. That is, the sign + (plus), written between two numbers, means the same as *and*.

Instead of writing 3 and 5 equals 8, we can write 3 + 5 = 8, read 3 plus 5 equals 8. That is, the sign =, written between two numbers, or expressions, means *equals*.

Instead of writing *dollars*, we can write the sign $. Thus $6.25, means 6 dollars and 25 cents.

13.	6 + 2 + 7 = ?	20.	5 + 6 + 7 = ?
14.	3 + 5 + 4 = ?	21.	8 + 4 + 9 = ?
15.	2 + 7 + 9 = ?	22.	9 + 3 + 11 = ?
16.	8 + 3 + 5 = ?	23.	8 + 5 + 7 = ?
17.	9 + 12 + 7 = ?	24.	11 + 7 + 8 = ?
18.	13 + 8 + 9 = ?	25.	9 + 6 + 7 = ?
19.	7 + 5 + 6 = ?	26.	8 + 14 + 9 = ?

26. WRITTEN EXERCISES.

27. Find the sum of 4, 7, 5, and 3.

4
7
5
3
19, Ans.

As the most convenient way, we write the numbers in a column, as in the example. Beginning at the bottom we add, 3 (and 5 are) 8, (and 7 are) 15, (and 4 are) 19, and write the sum, 19, below.

In adding it is better not to name the numbers we are adding; thus, in Ex. 27, omit the words enclosed in parentheses in the explanation above, and say 3, 8, 15, 19.

Copy and add the following:

(28.)	(29.)	(30.)	(31.)	(32.)
3	4	8	5	4
6	7	2	4	7
8	9	3	7	3
4	2	5	9	8
21				

33. Find the sum of the numbers in Ex. 28–32, beginning at the top and adding down the column.

NOTE. This second addition, if the result is the same, makes one conclude that the result is correct.

34. In one school there are 113 scholars, and in another 214. How many scholars are there in both?

35. July has 31 days, August 31 days, September 30 days, October 31 days, November 30 days, and December 31 days. How many days have these six months?

36. What is the sum of 203, 142, 313, and 121.

203	As we add units to units, tens to tens, etc. (those of the same kind), we write units under units, tens under tens, etc. Adding the units thus, 1, 4, 6, 9, we write the 9 units under the units' column; then adding the tens, 2, 3, 7, we write the 7 tens under the tens' column; and so we proceed till all the columns are added.
142	
313	
121	
Sum, 779	

Add the following numbers:

(37.)	(38.)	(39.)	(40.)
134	314	111	123
213	121	222	321
302	213	333	213
240	351	321	331
889			

(41.)	(42.)	(43.)	(44.)
1111	1234	2040	1324
2222	4321	1204	4231
3333	1423	3021	1342
3212	3021	2713	2102

45. Add together 36, 78, and 349.

	36
	78
	349
Ans.	463

Having written the numbers units under units, tens under tens, etc., we add the units, thus 9, 17, 23, or 2 tens 3 units. The 3 units we write under the units' column, and add the 2 tens to the tens in the tens' column, thus 2, 6, 13, 16 tens, or 1 hundred and 6 tens. The 6 tens we write under the tens' column, and add the 1 hundred to the hundreds in the hundreds' column, thus 1, 4 hundreds, which we write under the hundreds' column.

Copy and add:

(46.)	(47.)	(48.)	(49.)
11	*14*	*19*	*23*
4	*13*	*12*	*46*
17	*9*	*17*	*70*
21	*18*	*16*	*12*
16	*17*	*15*	*86*

(50.)	(51.)	(52.)	(53.)
217	*412*	*823*	*942*
304	*335*	*101*	*216*
851	*279*	*87*	*175*

54. One field contains 8 acres, and another 79 acres. How many acres are there in both?

55. If one house has 32 windows, another 27 windows, and another 18 windows, how many windows have the three houses?

56. Thomas has 20 books, George has 19 books, Joseph has 15 books, and Daniel has 12 books. How many books have they all?

57. Mr. Adams paid 202 dollars for a horse, 57 dollars for a cow, and 74 dollars for some sheep. How much did he pay for all?

58. On one tree were 17 pears, on another 426, on another 302, and on another 213. How many pears were there?

59. One farmer has 643 sheep, another has 529, and another has 375. How many have they all?

60. Mr. Atwood has 393 dollars in the bank, Mr. Jones has 539 dollars, and Mr. Johnson has 615 dollars. How much have they in the bank?

61. A locomotive went 118 miles one day, 197 another, 236 another, and 183 another. How far did it go?

27. ORAL EXERCISES.

62. What is the sum of 5, 7, 9, 8, and 4?

63. A boy paid 18 cents for a top, 5 cents for a pencil, 6 cents for oranges, and 9 cents for writing-paper. How many cents did he pay for all?

64. A farmer sold 3 bushels of potatoes to one man, 17 to another, 5 to another, and 8 to another. How many bushels did he sell?

65. John collected for his father 8 dollars from one man, 6 dollars from a second, 3 dollars from a third, and 7 dollars from a fourth. How many dollars did he collect?

66. James paid 35 cents for an arithmetic, 8 cents for a writing-book, 5 cents for a lead-pencil, and 9 cents for ink. How many cents did he pay for all?

67. A grocer sold a pound of cheese for 11 cents, a pound of crackers for 10 cents, and a pound of sugar for 9 cents. How many cents' worth did he sell?

68. A farmer has 12 acres of corn, 6 acres of wheat, 4 acres of rye, and 3 acres of oats. How many acres of grain has he?

69. In a certain orchard there are 23 apple-trees,

12 peach-trees, 9 pear-trees, 8 cherry-trees, and 7 quince-trees. How many trees are there in the orchard?

70. A lady gave 40 dollars for a watch, 8 dollars for a chain, 1 dollar for a key, and 7 dollars for a pin. How many dollars did she give for all?

71. A man paid 85 dollars for a horse, 6 dollars for a saddle, 3 dollars for a bridle, and 2 dollars for a whip. What did they all cost him?

72. James had 37 cents in his purse, 10 in one pocket, 9 in another pocket, and 5 in his hand. How many cents had he?

73. A miller bought 45 bushels of wheat, 8 of rye, 7 of corn, and 3 of buckwheat. How many bushels of grain did he buy?

74. A lady bought a silk dress for 25 dollars, a bonnet for 7 dollars, a shawl for 9 dollars, a pair of shoes for 3 dollars, a pair of gloves for 1 dollar, and had 10 dollars left. How many dollars had she at first?

28. WRITTEN EXERCISES.

75. Find the sum of 19.8, 67.17, and 143.76.

	19.8
	67.17
	143.76
Ans.	230.73

Having written units under units, tens under tens, tenths under tenths, etc., we begin at the right-hand column and add, thus, 6, 13 hundredths, or 1 tenth 3 hundredths. The 3 hundredths we write under the hundredths' column and add the 1 tenth to the tenths in the tenths' column, thus, 1, 8, 9, 17 tenths, or 1 unit 7 tenths. The 7 tenths we write under the tenths' column, and place the decimal point to separate it from the units, and then add the 1 unit to the units' column, and so on exactly as in Ex. 36.

NOTE 2. In United States money the dollar is the unit, and as 100 cents make a dollar, and 10 mills a cent, cents occupy two decimal places, tenths and hundredths, and mills one place, thousandths. Thus, $42.255 is 42 dollars and 25 hundredths of a dollar and 5 thousandths of a dollar, or 42 dollars 25 cents and 5 mills.

Copy and add the following:

(76.)	(77.)	(78.)	(79.)
$7.86	87.3	642	267
$5.49	65.9	579	478
$3.98	27.8	864	349
$17.33			

(80.)	(81.)	(82.)	(83.)
1234	3579	2167	8763
5678	2468	3589	7641
9753	8756	6872	5829
8276	4983	5463	3538

(84.)	(85.)	(86.)
37	7468	1326
842	85356	12847
7679	4807	78954
83468	329	90807

(87.)

14754
46873
34784
27956
17
25
31
21
10
124367, Ans.

In Ex. 87 we write the sum of the units of each column in its proper place beneath, and then add these sums. In adding long columns this is an excellent way. It often saves adding a column a second or third time after interruption, or to find how much belongs to the next left-hand column.

88. Find the sum of 8764, 137, and 41765.

89. Find the sum of 3, 18, 476, 8764, and 27634.

90. Find the sum of 19, 307, 6784, 29876, and 3037.

91. Find the sum of 8764, 397, 19469, and 27843.

92. Find the sum of 79.8, 8.43, 175.08, and 12.135.

93. Find the sum of $2.50, $12.47, $198, and $57.33.

94. Mr. Monroe owes $47.34 to one man, $53 to another, $87.13 to another, and $1.55 to another. How many dollars does he owe to these four men?

95. Mrs. Nason gave her daughter a $10 bill. The daughter paid $1.17 for a hat, $0.53 for trimmings, $2.50 for a pair of shoes, $0.95 for an arithmetic, $1.25 for a history, and brought back $3.60 in change. Did the daughter bring back the right change?

29. ORAL EXERCISES.

96. A lady bought a watch for $55, a chain for $8, and a breastpin for $5. How many dollars did she pay for these three articles?

97. If a laborer saves $25 in March, $9 in April, and $6 in May, how many dollars does he save in these three months?

98. A bouquet is made up of rosebuds worth 45 cents, heliotropes worth 12 cents, and running green worth 8 cents. What is the bouquet worth?

99. A lady paid 63 cents for a remnant of calico for a dress, 10 cents for buttons, and 7 cents for thread for the dress. How much did the materials for the dress cost her?

100. Of the trees in a nursery 57 are pear-trees, 13 peach-trees, and 5 plum-trees. How many trees are there in the nursery?

101. Under a chestnut-tree George picked up 18 chestnuts, John 11, and William 7. How many chestnuts did the three boys pick up in all?

102. A farmer gave $75 for a piece of land, $10 for fencing, and $4 for building the fence. What was the whole cost?

103. A drover bought of one man 27 cattle, of a second 13, and of a third 8. How many in all did he buy of these three men?

104. George paid for the cloth for a vest 95 cents, for the buttons 15 cents, and for thread 5 cents. How many cents in all did he pay out for his vest?

105. Of a class of boys there were found 18 who could add the numbers in their examples readily, 8 who could add them only very slowly, and 3 who could not add them at all. How many boys were there in the class?

106. Find the sum of 25, 14, 22, and 18.

Add by 10's; thus, 25 and 14 = 25 + 10 + 4; say 25, 35, 39. 39 and 22 = 39 + 10 + 10 + 2; say 39, 49, 59, 61, or say 39, 59, 61, adding the 20 at once. 61 and 18 = 61 + 10 + 8; say 61, 71, 79. Hence, to add the given numbers, say 25, 35, 39 (looking at 14), 59, 61 (looking at 22), 71, 79 (looking at 18).
Ans. 79.

107. John had 33 cents. If his father gives him 14 more, and his mother 10, how many cents will he have?

108. A drover bought at one time 18 sheep, at another 15, and at another 13. How many sheep did he buy in these three lots?

109. A father gave to the eldest of his four children 45 cents, to the second 33 cents, to the third 20 cents, and to the youngest 14 cents. How many cents in all did he give to the four?

110. How many rods is it round a field whose four sides measure, respectively, 32, 20, 9, and 13 rods?

111. John bought a slate for 25 cents, a dozen slate-pencils for 7 cents, a writing-book for 14 cents, and a primary arithmetic for 20 cents. What did he pay for all these articles?

112. In a certain school there are 30 in the fourth class, 25 in the third, 20 in the second, and 15 in the first. How many pupils are there in the four classes?

113. Arthur earned 27 cents Monday, 8 Tuesday, 7 Wednesday, 15 Thursday, 12 Friday, and 10 Saturday. How many cents did he earn during the week?

114. If a boy living in Cambridge but employed in Boston pays for his dinners for the six days of the week, respectively, 23 cents, 17 cents, 25 cents, 20 cents, 15 cents, and 17 cents, what do his six dinners cost him?

115. Mr. Clark's farm contains 20 acres of land for mowing and tillage, 16 acres of pasture, and 8 acres of wood land. How many acres are there in all?

116. Willie subscribed and paid for the following magazines: for Harper's Young People $2, for Wide Awake $2.50, and for St. Nicholas $3. How much did he pay for all?

117. If a boy spends 27 cents Monday, 33 cents Tuesday, and 36 cents Wednesday, how many cents does he spend in the three days?

118. A merchant sold a hat for $3.50, a pair of boots for $4.50, and a pair of gloves for $2. How many dollars did he get for all?

119. A school has one class of 15 pupils, another of 13 pupils, another of 11 pupils, and another of 10 pupils. How many pupils are there in these four classes?

120. At Christmas a lady paid $1.50 for cards, $2 for an album, and $0.75 for a book. How much did she pay for all these?

121. A farmer sold a heifer for $18, a pig for $12, and a sheep for $5. How much did he get for all?

122. A clerk made three sales of carpeting as follows: 20 yards, 25 yards, and 35 yards. How many yards did he sell in all?

123. What is the sum of $10, $15, $11, and $14?

124. How many are 15 + 10 + 5 + 7 + 3 + 2 + 0 + 8 + 4?

30. WRITTEN EXERCISES.

125. What is the sum of three hundred three, five thousand six hundred forty-nine, eighteen thousand nine hundred six, and forty thousand eight hundred seventy-four?

126. A man paid $250 for a span of horses, $215 for a carriage, and $85 for two harnesses. How many dollars did he pay for all?

127. What is the sum of 147, eight hundred four, 6345, eighteen, and forty-five hundredths, 576, and 12, and 8 tenths?

128. A farmer sold 3 loads of hay, the first weighing 1657 pounds, the second 1749, the third 1583; how many pounds of hay in the three loads?

129. A merchant sold goods to the amount of $28.15 on Monday, $33.84 on Tuesday, $17.56 on Wednesday, $23.75 on Thursday, $19.17 on Friday, and $31.43 on Saturday. How much did his sales during the week amount to?

130. A father left by will to his eldest son 185 acres of land, to his second son 157, to his third 87, and to his youngest 73. How many acres did he will to the four?

131. A newsboy sold the first week in May 455 papers, the second week 528, the third week 479, and the fourth week 487. How many did he sell in these four weeks?

132. Mr. Appleton's bill for groceries for Monday was $3.25, for Tuesday $1.16, for Wednesday $0.75, for Thursday $2.15, for Friday $1.44, and for Saturday $2.33. What was his bill for the week?

133. Three men A, B, and C, bought a wood lot. A paid $217.65, B $325.50, and C $283.75. What did the wood lot cost them?

134. Mr. Berry bought at the store articles as follows: sugar $1.15, flour $2.25, spices $0.45, starch $0.17, salt-fish $0.24. He handed the clerk a $5 bill and received in change a 50-cent piece, two 10-cent pieces, a 3-cent piece, and 1 cent. Was the change right?

135. I bought a lot of land for $1725, and paid for the building of a house on the lot $2375, for grading the grounds $25.75, and for fencing $52.25. What did the place cost me?

136. Rufus Holmes bought a suit of clothes for $21.50, an overcoat for $18.25, a pair of boots for $2.75, and a pair of gloves for $1.25. How many dollars will pay the bill?

137. George Munroe owes one man $344.25, another $146.18, and a third $57.13. How much does he owe to the three men?

138. A carpenter received for building 3 houses the following sums: $387, $765, $942. What did he receive in all?

139. Five loads of hay sold by a farmer weighed respectively 1681, 1947, 1399, 2015, 1861 pounds. How many pounds of hay did he sell?

140. Edward paid last term 90 cents for a Geog-

raphy, 55 cents for a Reader, 38 cents for a Grammar, and 28 cents for other articles. How much did they all cost?

141. By the census of 1890, the population of the following towns that constitute Dukes County was: Chilmark 353, Cottage City 1080, Edgartown 1156, Gay Head 139, Gosnold 135, Tisbury 1506. What was the population of Dukes County?

142. According to the census Plymouth had 273 operatives in boot and shoe factories, 143 in cotton and woollen mills, 45 in iron foundries, 133 rope and cordage makers, and 106 nail makers. How many persons were engaged in these different occupations?

143. Mr. Shumway's sales for six days were as follows: First day $39.62, second day $53.12, third day $47.96, fourth day $69.46, fifth day $41.83, sixth day $72.57. What was the sum of his sales?

144. By the census of 1890 Maine contains 33040 square miles, New Hampshire 9305 square miles, Vermont 9565 square miles, Massachusetts 8315 square miles, Connecticut 4950 square miles, Rhode Island 1250 square miles. What is the area of the New England States?

145. Mr. Clark's travelling expenses during the month of June were $25.57, July $32.40, August $53.50, September $113.65, October $50.81, November $72.83. What were his travelling expenses for the six months?

146. Mr. Kendrick's orchard yielded in 1889, five hundred eighty-four barrels of apples; in 1890, one hundred sixty-seven barrels; in 1891, nine hundred eleven barrels; in 1892, three hundred twenty-five barrels; in 1893, seven hundred forty-four barrels; in 1894, two hundred ninety-six barrels. How many barrels did the orchard yield in the six years?

Copy and add the following:

(147.)	(148.)	(149.)
6 457	$377.67	73 457
8 321	412.93	81 216
2 789	847.61	16 842
41 342	789.29	52 738
(150.)	(151.)	(152.)
16 809	$999.11	15 431
91 673	871.64	18 746
84 246	392.83	23 217
19 735	468.75	54 874
(153.)	(154.)	(155.)
$21.675	27 876	$210.16
94.215	53 439	408.49
62.845	87 216	768.87
73.155	95 754	844.33

156. Arlington received from local school-funds in a certain year $321.24, Cambridge $783.00, Concord $76.50, Framingham $75.50, Hopkinton $340. What amount did these towns receive from this source?

157. A road commissioner paid for removing snow during the month of February the following sums: February 9, $126.45, February 13, $96.34, February 23, $163.87, February 24, $72.22, February 28, $212.35. How much did he pay during the month?

158. There were in a certain year 661 different pupils in the schools of Abington, 620 in Bridgewater, 199 in Carver, 337 in Duxbury, 314 in Hanover, and 225 in Kingston. How many pupils attended school in these towns?

159. Acton received from the state school fund in one year $179.13, Ashland $190.00, Dracut $176.53, Tewksbury $171.55, Wayland $186.50. What sum was paid these towns?

For the several months of the years 1892, 1893, 1894, 1895, Mr. Pearson spent the following sums in his purchases:

	1892.	1893.	1894.	1895.
Jan.	$95.87	$87.23	$45.37	$73.65
Feb.	25.44	76.21	85.53	96.17
March	48.19	27.54	49.32	85.21
April	57.49	73.18	29.41	37.43
May	84.76	37.91	35.18	65.28
June	93.43	72.68	41.12	71.65
July	175.83	115.43	72.08	96.84
Aug.	118.19	99.84	68.19	93.72
Sept.	117.54	123.41	97.28	87.50
Oct.	99.43	89.41	85.02	83.19
Nov.	89.17	112.89	93.25	171.02
Dec.	97.13	85.13	104.10	150.25

How much did Mr. Pearson spend,

160. In Jan., Feb., and March, 1892?
161. In March, April, and May, 1893?
162. In the summer months of 1894?
163. In the last four months of 1895?
164. In the winter months of 1892–93?
165. In the spring months of 1894?
166. In the fall months of 1895?
167. In May, June, and July, 1893?
168. In the winter months of 1894–95?
169. In the last three months of 1892?
170. In Sept., 1892, 1893, 1894, and 1895?
171. In Oct., 1892, 1893, 1894, and 1895?
172. In Jan., 1892, 1893, 1894, and 1895?

In like manner, by various combinations of the sums given above, as many examples as may be needed for practice can be made.

$$9 - 4 = 5$$
$$6 - 2 = 4$$
$$3 - 2 = 1$$

SUBTRACTION.

31. ORAL EXERCISES.

1. A boy bought a velocipede for 7 dollars, and sold it afterwards for 5 dollars. How much did he lose?

2. In one class there are 13 pupils, and in another 8. How many more are there in one than in the other?

3. John worked 19 hours, but his brother only 8. How much longer did John work than his brother?

4. Frederic had 28 marbles, but gave his sister 7. How many had he left?

5. Henry had 15 pigeons; but he gave away 5, and 7 flew away. How many had he remaining?

6. One day William bought 13 apples, another day 4 plums, and another day 5 plums. How many more apples did he buy than plums?

7. How many are 11 less 4? 21 less 4? 31 less 4? 41 less 4? 51 less 4? 61 less 4? 71 less 4? 81 less 4? 91 less 4? 101 less 4?

8. How many are 14 less 7? 24 less 7? 34 less 7? 44 less 7? 54 less 7? 64 less 7? 74 less 7? 84 less 7? 94 less 7? 104 less 7?

9. Subtract by threes from 59 to 2.

10. Subtract by fours from 59 to 3.

11. If I buy 12 cents' worth of writing-paper, 5 cents' worth of pens, and hand the seller a 25-cent piece, how much change ought he to give me?

12. James owed William 25 cents, and William bought of James a knife for 20 cents. How much does James still owe William?

13. If George buys a knife for 37 cents and sells it for 45, how much does he make?

14. If from 43 chickens 11 are sold to one man and 9 to another, how many are left?

32. *Only numbers of the same kind can be subtracted from each other;* thus, we can take 4 books from 7 books; but we cannot take 4 books from 7 marbles.

33. **Subtraction** is the process of finding the *difference* between two numbers of the same kind.

34. The greater number is called the **Minuend**; the less number is called the **Subtrahend**; and the result is called the **Difference** or **Remainder.**

35. The *sign of subtraction*, —, called *minus*, signifies that the number after it is to be taken from the number before it; thus, $6 - 2 = 4$, that is, six minus two, or six diminished by two, equals four.

15. $17 - 8 = ?$
16. $15 - 9 = ?$
17. $27 - 8 = ?$
18. $32 - 5 = ?$
19. $43 - 4 = ?$
20. $45 - 8 = ?$
21. $55 - 7 = ?$
22. $23 - 8 = ?$
23. $24 - 7 = ?$
24. $35 - 6 = ?$
25. $44 - 9 = ?$
26. $56 - 7 = ?$
27. $46 - 8 = ?$
28. $58 - 11 = ?$

36. WRITTEN EXERCISES.

29. From 569 take 257.

Minuend,	569
Subtrahend,	257
Remainder,	312

Write units under units, tens under tens, etc., as in addition. Then 7 units from 9 units leave 2 units, which we write under the units' column; 5 tens from 6 tens leave 1 ten, which we write under the tens' column; 2 hundreds from 5 hundreds leave 3 hundreds, which we write under the hundreds' column. The remainder then is 3 hundreds, 1 ten, 2 units, or 312.

	(30.)	(31.)	(32.)
Minuend,	347	479	876
Subtrahend,	235	354	543
Remainder,	112		

	(33.)	(34.)	(35.)	(36.)
From	935	817	1467	2789
take	724	716	1354	1465

(37.)	(38.)	(39.)	(40.)	(41.)	(42.)
876	978	712	297	632	904
21	246	302	146	410	703

(43.)	(44.)	(45.)	(46.)	(47.)	(48.)
123	537	896	398	479	888
111	223	345	287	128	674

(49.)	(50.)	(51.)	(52.)	(53.)	(54.)
996	591	745	489	959	967
194	280	634	247	534	847

(55.)	(56.)	(57.)	(58.)	(59.)
2476	9679	1787	8778	9785
2154	7405	1346	5601	6774

60. James has 25 dollars, and Arthur has 15 dollars. How many more has James than Arthur?

61. One book has 76 pages, and another 34 pages. How many more has one than the other?

62. One railroad is 478 miles long, another is 354 miles long. How much longer is the one than the other?

63. A farmer paid 567 dollars for some cows, and sold them for 436 dollars. How much did he lose?

64. I had 987 dollars, but gave a friend 75 dollars. How much had I remaining?

65. A bridge was 275 feet long; and the river was only 54 feet wide. How much greater was the length of the bridge than the width of the river?

66. A farm was sold for 869 dollars, which cost 707 dollars. How many dollars were gained by the sale?

67. Robert found 278 chestnuts, Walter 107, and Edward 120. How many more did Robert find than Walter and Edward together?

68. Alice went to school 283 days, and Mary 171. How much longer did Alice go than Mary?

37. ORAL EXERCISES.

69. On one tree 25 apples were growing, and on another 9; but 10 have been picked from the first tree, and 5 from the second. How many apples remain on the trees?

70. James had 33 cents, and George gave him 7, Charles 6, Samuel 9, John 8; and then he paid 12 cents for a top. How many cents had he left?

71. A farmer had $65 in his pocket, paid $33 for a cow, $8 for a sheep, and $10 for farming tools. How much money did he have left?

72. A grocer sold a tub of butter for $12, some cheese for $9, and a lot of apples for 4. How much change must he give to the purchaser, who hands him in payment a $50 bill?

73. From a drove of 35 sheep the owner sold to one man 13, to another 8, and to another 4. How many were left in the drove?

74. A lady had a basket containing 34 apples. She distributed 8 in one family, 5 in another, 9 in another, 6 in another, and in another all that remained in the basket. How many did the last family receive?

75. A grocer bought a tub of butter for $10, a lot of cheese for $8, a barrel of sugar for $25, and sold the whole lot for $51. How much did he gain?

76. A lady went shopping with $50 in her purse. She bought a silk dress for $17, a bonnet for $5, 9 pairs of gloves for $2, a pair of shoes for $4, and then spent sundry small sums till she found she had $20 left. How much did she spend for sundries?

77. A boy received from his father 25 cents and from his mother 20. He then paid 12 cents for a picture-book, 10 for candy, and 8 for nuts. How many cents did he have left?

78. A drover bought 16 sheep of one man, 10 of another, and 8 of another. He sold from this number 7 to one man and 5 to another. How many did he have left?

79. A boy started for Boston with $1 in his purse. He paid 25 cents for street-car fares, 48 cents for a jack-knife, 15 cents for a writing-book, and 10 cents for ink and pens. How much money ought he to have left?

38. WRITTEN EXERCISES.

80. From 362 take 147.

Minuend,	362
Subtrahend,	147
Remainder,	215

As we cannot take 7 units from 2 units, *one* of the 6 *tens* is put with the 2 units, making 12 units, and then, 7 units from 12 units leave 5 units. Now as *one* of the 6 *tens* has been put with the 2 *units*, only 5 tens remain in the minuend, and 4 tens from 5 tens leave 1 ten, and, finally, 1 hundred from 3 hundreds leaves 2 hundreds; hence, the entire remainder is 2 hundreds, 1 ten 5 units, or 215.

81. From 467 take 293.
82. From 875 take 468.
83. From 953 take 872.

84. From 135.84 take 18.79.

	135.84
	18.79
Ans.	117.05

Writing units under units, tenths under tenths, and so on, we subtract exactly as in Ex. 80, remembering also to place the decimal point between units and tenths, that is, directly under the points in the minuend and subtrahend.

85. From 846.12 take 75.21.
86. Take 87.49 from 149.637.
87. Take 715.187 from 932.25.
88. From 194.87 subtract 76.49.

If in subtraction the work is correct, *the sum of the subtrahend and remainder must equal the minuend.*

89. Subtract 746.87 from 984.9.

Minuend,	984.9
Subtrahend,	746.87
Remainder,	238.03
Proof,	984.9

90. From $764.55 take $493.49.
91. Take $349.45 from $568.36.

(92.)

	(2) (9) (10)
Minuend,	3 0 0
Subtrahend,	1 7 4
Remainder,	1 2 6

In this example we cannot take 4 from 0, nor can we take from the 10's place, as there is 0 there; but we can take *one* of the 3 *hundreds* and separate the one hundred into 9 *tens* and 10 *units;* then we can take 4 units from 10 units, 7 tens from 9 tens, and 1 hundred from 2 hundreds, leaving 126 as the remainder.

	(93.)	(94.)	(95.)
From	800	9000	3070
take	437	2877	2891
Rem.	363		

	(96.)	(97.)	(98.)
From	77.76	564.3	348.7
take	39.87	279.28	29.654

	(99.)	(100.)	(101.)
From	7643	8276.4	5873
take	4976	987.32	4987

39. ORAL EXERCISES.

102. John had 47 cents, of which he gave his sister 12. How many cents did he have left?

103. George had 27 chickens, of which 11 died. How many were left?

104. Sarah is 9 years old and her mother is 33. What is the difference in their ages?

105. A man who owed $18 to one man and $11 to another, had $50 in his pocket. How many dollars will he have after he pays his debts?

106. From a barrel containing 45 gallons of syrup 14 had been sold. How many gallons still remained in the barrel?

107. A boy counted his chickens at night and found he had 33; the next morning he counted and there were only 25. How many were gone?

108. A man bought a harness for $31 and sold it for $19. How much did he lose?

109. How old was a man 23 years ago who is 57 to-day?

110. A boy had 50 cents. He bought a pound of walnuts for 12 cents, and a dozen oranges for 25 cents. How many cents did he have left?

111. A merchant sold some calico for 62 cents, some thread for 8, a thimble for 3, and received in payment a dollar-bill. How much change ought he to return?

112. A lady purchased some rosebuds for 40 cents and a calla lily for 15, and gave in payment a 50-cent piece and a 10-cent piece. How much change ought she to receive back?

113. From a cistern containing 85 gallons 43 were drawn out. How many gallons remained?

114. Mr. Means is 43 years old, his wife is 7 years younger, and their son, Freeman, is 24 years younger than his mother. How old is Freeman?

115. A drover bought 27 sheep; then he sold 8; then bought 10; and then sold 9. How many sheep did he have left?

116. If a boy who had 50 cents spent 10, then earned 12, and then spent 8, how many cents did he have left?

117. If I buy a horse for $85, pay $5 for keeping, $2 for shoeing, and sell it for $100, how much do I make?

118. A lady bought some cotton cloth for 42 cents, some ribbon for 10 cents, buttons for 15 cents, thread for 8 cents, and gave a dollar bill in payment. How much change should she receive?

119. Mary bought a handkerchief for 17 cents and a collar for 11 cents. She handed to the clerk a 25-cent piece and a 5-cent piece. How much change should she receive back?

120. Subtract by twos from 40 to 0; from 39 to 1.

121. Subtract by threes from 40 to 1; from 39 to 0; from 38 to 2.

122. Subtract by fours from 40 to 0; from 39 to 3; from 38 to 2; from 37 to 1.

123. Subtract by fives from 40 to 0; from 39 to 4; from 38 to 3; from 37 to 2; from 36 to 1.

124. Subtract by sixes from 40 to 4; from 39 to 3; from 38 to 2; from 37 to 1; from 36 to 0; from 35 to 5.

125.

From	11	11	17	23	25	33	35	41
take	4	7	9	6	8	5	7	2

126. What will remain if 9 be taken from 18? 7 from 17? 5 from 13? 4 from 16? 8 from 20? 6 from 18? 3 from 21?

127. From 5 + 7 + 4 + 8 + 3 + 9, take 9 + 3.

128. A boy having 35 marbles sold 15. How many did he then have?

129. From a barrel containing 32 gallons of vinegar 9 gallons were drawn out. How many gallons remained?

130. From a bin containing 75 tons of coal 9 tons were sold. How many tons remained?

131. If I sell a horse for $65 and receive $15 more than it cost me, how much did it cost me?

132. A boy having only a dollar went to the city. He paid 40 cents for railroad fare, 10 cents for street-car fare, 8 cents for candy, and 25 cents for his dinner. How many cents had he left?

133. John found 9 peaches under one tree, 7 under another, and 9 under another. If he gives 5 to his mother and 7 to his father, how many peaches will he have left?

134. If the distance from Natick to Wellesley is 3 miles, from Wellesley to Newton 8 miles, from Newton to Brighton 2 miles, and from Brighton to Boston 5 miles, and the distance from Dedham to Boston 10 miles, how much farther from Boston is Natick than Dedham?

40. WRITTEN EXERCISES.

135. If a man whose income is $2317 a year spends $350 for house-rent and $879 for all other purposes, how much does he save?

136. How many years from the discovery of America in 1492 to the settlement of St. Augustine in 1565?

137. How many years from the discovery of America to the Declaration of Independence in 1776?

138. A man who had 1764 sheep sold 987 of them. How many did he then have?

139. Mr. James deposited in a certain bank $1374.27, and afterwards drew out $795.43. How much did he then have in the bank?

140. A owed B $133 and afterwards paid $65.43. How much did A then owe to B?

141. Mt. Etna is 10874 feet high, and Mt. Washington is 6226 feet high. How many feet higher is Mt. Etna than Mt. Washington?

142. Mr. Warner began business with $1973, and at the end of a year retired from business with $3317. How much did he gain during the year?

143. A man who had in his pocket $354, paid out of it a debt of $197.23. How much money did he have left?

144. Queen Victoria was born in 1819. How old was she in 1895?

145. Out of a cistern containing 347 gallons 175 were drawn. How many gallons were left in the cistern?

146. F. A. Worcester & Co. bought 415 yards of carpet. From this they sold 85 yards to Mr. Longfellow, 48 to Mr. Wilson, and 55 to Mr. Wyman. How many yards of this lot of carpeting did they have left?

147. Trinity church spire in New York is 284 feet high, Bunker Hill Monument is 221 feet high. How many feet higher is the spire than the monument?

148. The Washington Monument is 555 feet in height. How much higher is it than the spire of Trinity church and Bunker Hill Monument added together?

149. Mr. Battelle had 275 barrels of apples in 1894, and 162 barrels in 1895. How many more barrels did he have in 1894 than in 1895?

150. Mr. Copeland paid $1200 for his place, and sold it for $950.00. How much did he lose?

151. A borrowed $578.62; and soon paid $438.71. How much remained due?

152. A carpenter built one house for $5783, and another for $5873. How much more did the second house cost than the first?

153. The diameter of the earth at the equator is 7925 miles, at the poles 7899. How much greater is the diameter of the earth at the equator than at the poles?

154. The largest tree known in California is 325 feet high. How much higher is it than Bunker Hill Monument, which is 221 feet high?

155. An orchard contains 576 apple-trees and 467 peach-trees. How many trees in all? How many more apple-trees than peach-trees?

156. If the circumference of the earth is 25000 miles, and the diameter 8000, how many miles greater is the circumference than the diameter?

157. A man bought a farm for $7500 and paid $350 for stock. He afterwards sold the whole for $9000. Did he gain or lose, and how much?

158. Mr. Brown deposited in the bank $275 on Monday, $589 on Tuesday, $375 on Wednesday, $712 on Thursday, $917 on Friday; Saturday he drew out $2000. How much of his money remained in the bank?

159. Printing was invented A.D. 1441. How many years ago? The first newspaper was published in America A.D. 1690. How many years was this after the invention of printing?

160. The amount of Mr. Bacon's sales for July was $7563.81, which was $275.67 more than in the same month last year. How much did he sell in July last year?

161. New Hampshire contains 9305 square miles, and Massachusetts 8315 square miles. How many more square miles does New Hampshire contain than Massachusetts?

162. A strawberry bed yielded 1785 boxes of berries in 1894, and only 1236 in 1895. How much more was the yield in 1894?

163. The population of Medford was 7573 in 1880, and 11079 in 1890. What was the increase in ten years?

164. In 1880 there were 9661 horses in Rhode Island and 21933 in Delaware. How many more horses were there then in Delaware than in Rhode Island?

165. A farmer planted one year 3 fields of corn, which yielded 124, 96, and 108 bushels respectively. The next year he planted one field only, which yielded 521 bushels. How many more bushels were raised the second year than the first?

166. A grain-dealer bought 1000 bushels of wheat; he sold 376 bushels to one man, and 278 to another. How many bushels were left?

Subtract	From
167. 2753 from 3672	172. 780.02 take 569.45
168. $53.79 from $66.80	173. 1235 take 905
169. 3782 from 4893	174. $27.63 take $16.08
170. $64.38 from $93.41	175. 5876 take 2165
171. 3956 from 7231	176. $35.67 take $34.76

177. From nine hundred forty-seven dollars and thirty-five cents, take four hundred four dollars and seventeen cents.

178. If I sell 648 sheep from the 1204 that I own, how many shall I have left?

179. If Mr. Fox earns $756.45 in a year and spends for board $217.75, for clothing $65.24, and for all other expenses $95.66, how much will he have left of his year's earnings?

180. J. F. Sweetser & Co. bought 847 yards of carpet. From this they sold to Mr. Brewer 57 yards, to Mr. Caldwell 35, to Mr. Rindge 123, to Mr. Nash 28. How many yards of this lot did J. F. S. & Co. have left?

181. Out of a hogshead containing 756 quarts of syrup were drawn 379 quarts. How many quarts were left in the hogshead?

182. Mr. Maguire pays $385.49 of a debt of $12765 which he owes to Mr. Bigelow. How much does Mr. M. still owe Mr. B.?

183. Of my deposit of $373 in the First National Bank I drew out first $218.75, and then $135.42. How much of my deposit remained in the bank?

184. From the sum of seven hundred, and 15 thousandths, and 3 thousand, and 5 hundredths, subtract 25 hundred, and twenty-five hundredths.

185. A country merchant took to Boston $1000, with which to buy goods. For dress goods he paid $255.13, for ready-made clothing $123.44, for hats and caps $45.29, boots and shoes $205.87, hard-ware $117.63, and groceries $195.18. How much remained of his $1000?

186. John Mason gave his clerks, Frank and Charles, $10.00 for an excursion to Mt. Wachusett. They paid $5.00 for a team, $0.50 for having the horse put up and fed, and $1.50 for their dinner. How much of the $10 did they bring back if these were all their expenses?

187. Mr. Dana bought a pair of horses for $485. In payment he gave a gold watch valued at $125, a silver watch valued at $17, three one-hundred dollar bills, and a fifty-dollar bill. How much change ought Mr. D. to receive back?

188. Mrs. Page bought a bonnet-frame for $0.55, some lace for $1.13, ribbon for $0.83, and a feather for $1.17, and gave in payment two two-dollar bills. How much change ought she to receive back?

189. From the sum of sixteen hundred, and six hundredths and 705.14 take 814.25.

190. Charles Moore did work for Mason Brothers on March 17, to the amount of $3.25; on March 19, to the amount of $2.17; and during the week ending April 7, to the amount of $23.13. Mason Brothers paid Charles Moore on this account, April 8, $5.13; April 25, $7.49; May 7, $8.75. How much do Mason Brothers owe Charles Moore on this account?

191. How much money must a person who has $1783.25 borrow to pay $3183 for a farm, and $273.17 for stock and farming tools?

192. John Murray started for Washington with $100 in his purse. For his railroad fare he paid $24.50; for express, $0.87; for hack-hire, $3.75; for board, $27.87; for other incidental expenses, $13.45 How much of the $100 did he have left?

193. Frank Jay went to Lake Sebago on a camping-out trip. His outfit cost him $2.14; his steamboat fare to Portland was $1; railroad fare to the lake $0.50; he paid for a boat to use on the lake $1; his return fares were by rail $0.50 and by boat $1, and for food he paid out $3. How much did he have left of $10 which his father gave him for the trip?

For the several months of the years 1892, 1893, 1894, 1895, Mr. Pearson spent the following sums in his purchases:

	1892.	1893.	1894.	1895.
Jan.	$65.84	$82.21	$75.34	$74.69
Feb.	85.47	72.23	85.57	119.18
March	48.19	97.54	92.43	85.21
April	53.49	73.13	49.21	85.13
May	84.76	87.91	85.13	97.28
June	73.43	77.62	92.16	78.16
July	115.83	157.48	52.90	44.81
Aug.	128.19	71.84	63.19	73.92
Sept.	141.57	57.28	123.41	89.50
Oct.	59.34	95.14	89.20	93.81
Nov.	88.79	69.17	93.52	127.01
Dec.	65.31	87.43	101.04	120.95

Find the difference between the amount Mr. Pearson spent,

194. In Jan. and Feb. 1892 and Jan. and Feb. 1893.

195. In March and April 1892 and March and April, 1894.

196. In the summer months of 1893 and those of 1894.

197. In the first three months of 1892 and the first three of 1893.

198. In the spring months of 1892 and those of 1893.

199. In the last three months of 1893 and the last three of 1895.

In like manner, by various combinations of the sums given above, as many examples as may be needed for practice can be made.

$$\begin{array}{r} 4 \times 3 = 12 \\ 3 \times 2 = 6 \\ \hline 12 \times 6 = 72 \end{array}$$

MULTIPLICATION.

41. ORAL EXERCISES.

1. If 1 orange costs 4 cents, what will 3 oranges cost?

Solution. — If 1 orange costs 4 cents, 3 will cost (4 + 4 + 4) cents = 12 cents; that is, 3 will cost 3 times 4 cents, or 12 cents.

2. At $2 a bushel what are 2 bushels of chestnuts worth? What are 3 worth?

3. What cost 3 oranges at 2 cents apiece? 4 oranges? 5 oranges? 6 oranges?

4. At $4 a yard what will 3 yards of cloth cost? What will 5 yards cost? What will 4 yards cost? What will 6 yards cost?

5. If there are 2 pints in a quart, how many pints are there in 6 quarts? In 8 quarts? In 9 quarts? In 10 quarts and 1 pint?

6. If there are 4 quarts in a gallon, how many quarts are there in 3 gallons? In 5 gallons? In 7 gallons?

7. If I sell 3 cords of wood at $6 a cord, and 6 barrels of apples at $2 a barrel, how many dollars shall I receive for the wood? How many for the apples? How many for both?

8. At 8 cents a pound, what will 4 pounds of sugar cost? 5 pounds? 7 pounds? 8 pounds? 9 pounds? 10 pounds?

9. Mary bought 3 yards of ribbon at 7 cents a yard, and 4 yards of calico at 9 cents a yard. How much did the whole cost?

10. What cost 9 yards of cotton cloth at 8 cents a yard? 10 yards?

11. If a horse travels 6 miles an hour, how many miles will he travel in 5 hours? In 7 hours? In 8 hours?

12. In a certain orchard there are 8 rows of trees, with 11 trees in each row. How many trees are there in the orchard?

13. How much more is 7 times 7 than 6 times 8? 9 times 9 than 8 times 10?

14. Jane buys 8 skeins of silk at 3 cents a skein, and hands to the salesman a 25-cent piece. How much change ought she to receive back?

15. Take 9, subtract 6, multiply the result by 3, then add 3, multiply by 4, subtract 37, multiply by 5; result?

16. How many are 2×3? 3×2? 4×3? 4×5? 3×4? 2×5? 5×2? 3×7? 9×5? 7×6? 5×8? 7×9? 6×4? 11×4? 8×9? 9×4? 8×4? 3×9? 7×10? 3×11?

17. How many are 6×6? 5×4? 9×6? 7×8? 6×5? 10×7? 4×7? 9×11? 6×10? 5×7? 7×4? 3×10? 2×11?

18. How many are 4×12? 12×4? 8×2?

5 × 9? 11 × 6? 9 × 7? 5 × 5? 7 × 7? 8 × 11? 12 × 3? 10 × 4? 7 × 3? 5 × 3?

19. How many are 6 × 11? 10 × 6? 9 × 8? 5 × 10? 8 × 8? 4 × 11? 8 × 6? 9 × 3? 5 × 11? 2 × 9? 8 × 5? 12 × 2? 3 × 8?

20. How many are 7 × 5? 8 × 7? 12 × 6? 6 × 12? 10 × 9? 9 × 9? 5 × 6? 12 × 5? 6 × 7? 11 × 7? 11 × 3? 7 × 11? 3 × 6?

42. **Multiplication** is the process of finding how many units there are in any number of times a given number.

The **Multiplicand** is the number to be repeated.

The **Multiplier** is the number which shows how many times the multiplicand is to be taken.

The **Product** is the *result* of the multiplication.

The *Multiplicand* and *Multiplier* are called **Factors.**

43. The *sign of multiplication*, ×, signifies that the two numbers between which it stands are to be multiplied together; thus, 6 × 5 = 30, that is, six multiplied by five equals thirty; or, six times five are thirty.

44. *The multiplier is always an abstract number.*

The product is of the same kind as the multiplicand.

Thus, in Ex. 1, the multiplier is 3, not 3 oranges. We cannot take 4 cents 3 *oranges* times; but we take 4 cents 3 times, that is, as many times as there are units in the number of oranges, and the answer is *cents*, 3 times 4 cents = 12 cents.

45. The pupil before advancing further must learn the following

Multiplication Table.

1 × 1 = 1	2 × 1 = 2	3 × 1 = 3	4 × 1 = 4
1 × 2 = 2	2 × 2 = 4	3 × 2 = 6	4 × 2 = 8
1 × 3 = 3	2 × 3 = 6	3 × 3 = 9	4 × 3 = 12
1 × 4 = 4	2 × 4 = 8	3 × 4 = 12	4 × 4 = 16
1 × 5 = 5	2 × 5 = 10	3 × 5 = 15	4 × 5 = 20
1 × 6 = 6	2 × 6 = 12	3 × 6 = 18	4 × 6 = 24
1 × 7 = 7	2 × 7 = 14	3 × 7 = 21	4 × 7 = 28
1 × 8 = 8	2 × 8 = 16	3 × 8 = 24	4 × 8 = 32
1 × 9 = 9	2 × 9 = 18	3 × 9 = 27	4 × 9 = 36
1 × 10 = 10	2 × 10 = 20	3 × 10 = 30	4 × 10 = 40
5 × 1 = 5	6 × 1 = 6	7 × 1 = 7	8 × 1 = 8
5 × 2 = 10	6 × 2 = 12	7 × 2 = 14	8 × 2 = 16
5 × 3 = 15	6 × 3 = 18	7 × 3 = 21	8 × 3 = 24
5 × 4 = 20	6 × 4 = 24	7 × 4 = 28	8 × 4 = 32
5 × 5 = 25	6 × 5 = 30	7 × 5 = 35	8 × 5 = 40
5 × 6 = 30	6 × 6 = 36	7 × 6 = 42	8 × 6 = 48
5 × 7 = 35	6 × 7 = 42	7 × 7 = 49	8 × 7 = 56
5 × 8 = 40	6 × 8 = 48	7 × 8 = 56	8 × 8 = 64
5 × 9 = 45	6 × 9 = 54	7 × 9 = 63	8 × 9 = 72
5 × 10 = 50	6 × 10 = 60	7 × 10 = 70	8 × 10 = 80
9 × 1 = 9	10 × 1 = 10	11 × 1 = 11	12 × 1 = 12
9 × 2 = 18	10 × 2 = 20	11 × 2 = 22	12 × 2 = 24
9 × 3 = 27	10 × 3 = 30	11 × 3 = 33	12 × 3 = 36
9 × 4 = 36	10 × 4 = 40	11 × 4 = 44	12 × 4 = 48
9 × 5 = 45	10 × 5 = 50	11 × 5 = 55	12 × 5 = 60
9 × 6 = 54	10 × 6 = 60	11 × 6 = 66	12 × 6 = 72
9 × 7 = 63	10 × 7 = 70	11 × 7 = 77	12 × 7 = 84
9 × 8 = 72	10 × 8 = 80	11 × 8 = 88	12 × 8 = 96
9 × 9 = 81	10 × 9 = 90	11 × 9 = 99	12 × 9 = 108
9 × 10 = 90	10 × 10 = 100	11 × 10 = 110	12 × 10 = 120

46. WRITTEN EXERCISES.

21. In one year there are 365 days. How many days are there in 3 years?

By addition.	*By multiplication.*
365 days	365 days
365 "	3
365 "	Product, 1095 days.
Sum, 1095 days.	

In 3 years there are 3 times as many days as in 1 year, and hence the number of days in 3 years can be obtained by *adding*, as shown at the left; or, more briefly, by *multiplying;* thus, 3 times 5 units = 15 units = 1 ten and 5 units; writing the 5 units in the units' place, we then say 3 times the 6 tens are 18 tens, and add the 1 ten previously obtained, making 19 tens = 1 hundred and 9 tens; writing the 9 tens in the tens' place, we then say 3 times 3 hundreds are 9 hundreds, and add the 1 hundred previously obtained, making 10 hundreds = 1 thousand and 0 hundreds; and these written in their place give the true product, 1095 days.

22. A certain house has 43 windows. How many windows would 5 such houses have?

23. If Henry picks 127 apples in an hour, how many can he pick in 9 hours?

24. If a steamer can go 258 miles in a day, how far can it go in 3 days?

25. In a certain town there are 415 voters. How many would there be in 9 such towns?

26. If a bushel of corn is worth 75 cents, what are 8 bushels worth?

27. If a man can earn $658 a year, how much can he earn in 7 years?

28. Multiply 16.76 by 8.

16.76
8
134.08, Ans.

The process is the same as in Ex. 21, but the decimal point must be placed between units and tenths.

(29.) 717 × 7 = 5719

(30.) 734 × 6

(31.) 453 × 8

(32.) 847 × 9

(33.) 91.6 × 6 = 549.6

(34.) $45.16 × 5 = $225.80

(35.) $217.65 × 7

(36.) 714 × 4

(37.) 983 × 3

(38.) 785 × 6

(39.) 8431 × 7

(40.) 687 × 5

(41.) 429 × 4

(42.) 189 × 8

(43.) 764 × 9

(44.) 811 × 6

(45.) 36.5 × 8

(46.) 478 × 4

(47.) 369 × 2

(48.) 348 × 7

(49.) 917 × 8

(50.) 628 × 5

(51.) 87.6 × 6

47. ORAL EXERCISES.

52. At 6 cents a pound, what will 11 pounds of sugar cost?

53. If a wheel revolves 8 times in a minute, how many times will it revolve in 9 minutes?

54. If I pay 10 dollars for 1 stove, how much must I pay for 7 stoves?

55. In an orchard there are 8 trees in a row. How many trees are there in 6 rows?

56. If a boy earns 9 dollars a month, how much will he earn in 6 months?

57. How many dollars will pay for 12 barrels of flour at 6 dollars a barrel?

58. If a pair of skates cost 3 dollars, how much will 12 pairs cost?

59. At 11 cents a pound, what will 8 pounds of walnuts cost?

60. If a ship sails 9 miles an hour, how far will it sail in 7 hours?

61. At 4 cents a sheet, what will 8 sheets of gingerbread cost?

62. If 2 men can build a wall in 4 days, how long will it take 1 man to build it?

63. If 6 men can do a piece of work in 8 days, how long will it take 1 man to do it?

64. If 5 men can reap a field of grain in 6 days, how long will it take 1 man to reap it?

65. How many are 9 times 8? 5 times 3? 12 times 5? 11 times 6? 4 times 10? 9 times 7? 8 times 4? 6 times 5? 10 times 6? 4 times 10?

66. How many are 8×8? 9×1? 12×6? 7×7? 10×8? 6×6? 10×2? 7×3? 9×5? 4×4? 4×9? 8×3? 7×4?

67. How many are 5×4? 6×9? 8×5? 9×3? 7×4? 9×10? 10×5? 11×5? 12×5?

68. How many are 3 × 10? 3 × 11? 3 × 12? 4 × 10? 4 × 11? 4 × 12? 9 × 9?

69. How many are 12 × 2? 12 × 4? 12 × 7? 12 × 8? 12 × 9? 12 × 10? 12 × 11? 12 × 12?

48. WRITTEN EXERCISES.

70. Multiply 364 by 23.

Multiplicand,	364
Multiplier,	23
	1092
	728
Product,	8372

First multiply by the 3 as though it was the only figure in the multiplier; then multiply by the 2, and write the right-hand figure of this product in the place of *tens;* for multiplying by the 2 tens is the same as multiplying by 20, and 20 times 4 units are 80 units = 8 tens; that is, the product of *units* by *tens* is *tens.* Multiplying each figure of the multiplicand by the 2 tens, and adding the 1092 and the 728 tens, we obtain the true product, 8372.

71. If 45 men can build a wall in 37 days, how long will it take 1 man to build the same wall?

72. What is the value of 27 horses at $87 each?

73. If a train of cars runs 24 miles an hour, how far will it run in 36 hours?

74. How many meters of cloth in 783 pieces, if each piece contains 39 meters?

75. Multiply 43.75 by 35.

	43.75
	35
	21875
	13125
Ans.	1531.25

49. An example in multiplication may be proved by *multiplying the multiplier by the multiplicand, and if the work is correct the numerical product will be the same as before.*

76. Multiply 76 by 43.

			PROOF.
Multiplicand,	76		43
Multiplier,	43		76
	228		258
	304		301
Product,	3268	=	3268

(77.)	(78.)	(79.)	(80.)
833	234	317	829
12	17	19	23

(81.)	(82.)	(83.)	(84.)
67.4	46.17	345	47.9
43	27	82	18

(85.)	(86.)	(87.)	(88.)
587	856	487	287
53	74	35	57

50. As removing a figure one place to the left multiplies it by ten, two places by a hundred, etc., therefore to multiply by 10, 100, 1000, or 1 with any number of ciphers annexed,

Rule.

Move the decimal point as many places to the right as there are ciphers in the multiplier.

NOTE. If there are not as many decimal places in the multiplicand as ciphers in the multiplier, in order that the point may be moved as required, ciphers must be annexed to the multiplicand.

89. Multiply 5.4 by 10. Ans. 54.
90. Multiply 4.7 by 100. Ans. 470.
91. Multiply 73 by 100. Ans. 730.
92. Multiply 31.4 by 10; by 100; by 1000.
93. Multiply 876 by 100; by 10; by 1000.
94. Multiply 47.3 by 100; by 10; by 10000.
95. Multiply 51.34 by 10; by 100; by 10000.
96. Multiply 4.78 by 1000; by 10; by 100.
97. Multiply 63.817 by 100; by 10; by 1000.
98. Multiply 814 by 100; by 10; by 10000.

51. ORAL EXERCISES.

99. At $4 a yard, what will 6 yards of broadcloth cost? 7 yards? 9 yards? 5 yards?

100. If I earn $8 a week and spend $5, how many dollars shall I save in 5 weeks?

101. If I buy 7 yards of cloth at $3 a yard, and sell the whole for $27, how much do I gain?

102. If I pay $4 a yard for 8 yards of broadcloth for a suit of clothes, $3 for the trimmings, $5 for making the coat, $2 for making the pants, and $1 for making the vest, how much does the suit cost me?

103. At $3 a pair, what will 5 pairs of shoes cost? 7 pairs? 11 pairs? 8 pairs?

104. At 11 cents apiece, what will 5 pineapples cost? 4 pineapples?

105. In a week there are 7 days; how many days are there in 4 weeks? In 6 weeks? In 8? In 10?

106. William had 3 cents, Samuel had 3 times as many as William, and Lyman 5 times as many as Samuel. How many did Lyman have?

107. If I buy 4 writing-books at 7 cents each, and 5 at 8 cents each, and sell them all at 10 cents each, how much shall I make?

108. In a peck there are 8 quarts. How many quarts are there in 4 pecks? In 6 pecks?

109. In a bushel there are 4 pecks. How many pecks are there in 5 bushels? In 8 bushels?

110. How many quarts are there in a bushel?

111. Mary bought 5 yards of ribbon at 9 cents a yard, and gave in payment 5 ten-cent pieces. How much change ought she to receive back?

112. Two men, A and B, start 63 miles apart to move toward each other, A at the rate of 3 miles an hour, and B at the rate of 4 miles an hour. How far will they move toward each other in 1 hour? How far in 5 hours? How far in 9 hours?

113. Of the 63 miles (Ex. 112) how many does A travel in 9 hours? How many does B travel in 9 hours?

114. At 9 cents a pound, what will 7 pounds of maple sugar cost? 9 pounds? 8 pounds? 5 pounds? 12 pounds? 10 pounds?

115. A teacher bought 12 writing books at 10 cents apiece. How much did she pay for them?

116. In a square yard there are 9 square feet. How many square feet are there in 5 square yards? In 7 square yards? In 9 square yards? In 11 square yards?

117. If I buy 4 slates at 9 cents each, and 5 at 12 cents each, and sell them all at 11 cents each, how much shall I make?

118. A farmer sold 4 hens at $1 each, 2 pigs at $3.50 each, and 3 sheep at $5 each. How many dollars did he get for all?

119. When oranges cost 3 cents each, and apples 2 cents each, what will 7 oranges and 5 apples cost?

120. If a man earns $20 a month and spends $12, how many dollars can he save in 12 months?

121. If it takes 8 men 6 days to do a piece of work, how long will it take one man to do it?

122. If I buy 8 oranges at 3 cents each, 4 apples at 2 cents each, and a quarter of a pound of candy for 8 cents, and give in payment a fifty-cent piece, how much change should I receive back?

123. What will 11 yards of print cost at 7 cents a yard? At 8 cents? At 9 cents? At 11 cents? At 12 cents?

52. WRITTEN EXERCISES.

124. Multiply 76.43 by 30.

$$\begin{array}{r} 76.43 \\ 30 \\ \hline \text{Ans. } 2292.90 \end{array}$$

The decimal part of this answer can be read as 90 hundredths; or the cipher may be omitted, and the 90 hundredths be reduced to 9 tenths.

125. Multiply 64 by 420.

$$\begin{array}{r} 64 \\ 420 \\ \hline 1280 \\ 256 \\ \hline \text{Ans. } 26880 \end{array}$$

126. Multiply 456 by 50; by 30; by 60.
127. Multiply 217 by 40; by 20; by 70.
128. Multiply 8.46 by 2100; by 140; by 20.
129. Multiply 1217 by 80; by 170; by 90.
130. Multiply 3468 by 230; by 320; by 540.

131. Multiply 765 by 203.

765
203
2295
1530
Ans. 155295

132. Multiply 806 by 305; by 207.
133. Multiply 204 by 21; by 103.
134. Multiply 7060 by 40; by 55.
135. Multiply 8764 by 80; by 75.
136. Multiply 632.14 by 701; by 107.
137. Multiply 8007 by 102; by 201.
138. Multiply 654.32 by 47; by 407.
139. Multiply 300.07 by 903; by 39.
140. Multiply 634.16 by 80; by 75.
141. Multiply 718.9 by 70; by 93.
142. Multiply 876.12 by 700; by 777.
143. Multiply 652.1 by 35; by 80.
144. Multiply 817 by 80; by 25.
145. Multiply 9230 by 70; by 17.
146. Multiply 6724 by 45; by 65.
147. Multiply 18 407 by 32; by 302.
148. Multiply 765.8 by 40; by 44.
149. Multiply 987.5 by 25; by 50.
150. Multiply 2040 by 75; by 705.
151. Multiply 6005 by 302; by 203.

152. A farmer sold 756 barrels of apples at $1.75 a barrel. How much should he receive?

153. Mr. Snow saves out of his earnings $87.35 a month. What sum does he save in 12 months?

154. The President of the United States receives a salary of $50000 a year. What will he save in a year of 365 days, if his expenses are $89 a day?

155. Mr. Talbot bought during the month of April 1756 cans of milk at 28 cents a can. How much ought he to pay for the milk?

156. Mr. Story, a conductor on the New York and New England Railroad, travels 96 miles a day. How many miles does he travel in 26 days?

157. A commercial traveller finds that his travelling expenses average $106.75 a month. What are his travelling expenses in 18 months?

158. If a hogshead contains 63 gallons, how many gallons are there in 12 hogsheads? In 15 hogsheads? 37 hogsheads? 45 hogsheads?

159. If there are 31.5 gallons in a barrel, how many gallons are there in 5 barrels? In 13 barrels? 29 barrels? 45 barrels?

160. A bought a car load of coal containing 5 tons of 2240 pounds to a ton. How many pounds did he buy?

161. One bushel, even or stricken measure, contains 2150.42 cubic inches. How many cubic inches in 9 bushels? In 13 bushels? 17 bushels? 35 bushels? 47 bushels? 60 bushels?

162. One bushel, heaped measure, contains 2688 cubic inches. Find the number of cubic inches in 13 bushels. In 17 bushels. 84 bushels. 95 bushels.

163. If one bunch of laths is used to cover 15 square feet of surface, how many square feet can be covered with 95 bunches? With 117 bunches? With 245 bunches?

164. A perch of stone is 16.5 cubic feet. If one perch can be carried at a load, how many cubic feet can be carried in 16 loads? In 48 loads?

165. If a barrel of kerosene contains 44 gallons, what would it cost at 9 cents a gallon? What would it cost at 11 cents a gallon? At 13 cents?

166. Mr. Smith earns $75 a month. What does he earn in 9 months? In 13 months? 18 months? 24 months?

167. A man bought 15 city lots at $475 each. How much did they cost him?

(168.)	(169.)	(170.)	(171.)
347	683	796	437
18	23	27	32
(172.)	(173.)	(174.)	(175.)
987	567	743	386
37	42	28	53
(176.)	(177.)	(178.)	(179.)
697	734	789	675
45	37	58	42
(180.)	(181.)	(182.)	(183.)
1753	2357	3456	6984
62	67	75	86
(184.)	(185.)	(186.)	(187.)
29678	38567	47456	56345
173	145	236	268

188. In a field of corn there are 123 rows, and in each row 83 hills. How many hills of corn are there in the field? If there are 4 stalks in each hill, how many stalks are there in the field?

189. In a train of 17 cars each car contains 83764 pounds of freight. How many pounds of freight are there on the train?

190. How many men are there in 37 regiments, if there are on an average 813 men in each regiment?

191. For the year 1894 it cost the city of Cambridge for each pupil in a Grammar School $19.78. There were 10 Grammar Schools, with an average of 549 pupils each. What, then, did it cost the city to maintain its Grammar Schools for the year 1894?

192. If six thousand four hundred eighty-seven is the multiplicand, and three hundred twenty-eight the multiplier, what is the product?

193. In one day there are twenty-four hours. How many hours are there in a year of three hundred sixty-five days?

194. Texas is nearly equal in area to 32 such States as Massachusetts. The area of Massachusetts is 8315 square miles. About how many square miles are there in Texas?

195. John Graham, a dealer in grain, sold to K. F. Emerson & Co. 315 barrels of flour at $7.50 a barrel, 415 bags of corn at $2.15 a bag, and 258 bushels of oats at $0.57 a bushel. Find the amount of K. F. E. & Co.'s bill.

196. Multiplicand = 700.4; multiplier = 37; product = ?

197. If I pay $5.75 a ton for coal, and $0.25 a ton for putting it in, what will my year's supply of 17 tons cost me?

198. If it costs $23543 to build a mile of railroad, how much at this rate would it cost to build 19 miles?

199. If Mr. Young earns $21 a week, and his expenses are $14 a week, how much does he save in 52 weeks?

200. If Mr. Young earns $21 a week, how much will he earn in a year of 52 weeks?

201. If Mr. Young's expenses are $14 a week, how much are his expenses for 52 weeks?

202. Virginia contains 40450 square miles. What is its population, if there are 38 persons to a square mile?

203. If a horse eats a bushel of oats a week, and oats are $0.62 a bushel, how much must be paid for oats to last 15 horses for 52 weeks?

204. Sound travels 1125 feet a second. How far will it travel in 53 seconds?

205. Frank Hoyt sold 37 barrels of flour at $6.52 a barrel, and 45 bags of corn at $2.17 a bag. Find the amount of these two sales.

206. If hay is $18.75 a ton and oats $0.58 a bushel, what must I pay for 7 tons of hay and 53 bushels of oats?

207. What will 1353 tons of steel rails cost at $35 a ton?

208. Light travels 186380 miles a second. How far will it travel in 60 seconds, that is, in a minute?

209. How many yards in 35 bales of goods, each bale containing 43 pieces, and each piece 34 yards?

210. A cattle train is made up of 23 cars, each car containing 47 sheep. If each sheep weighs 89 pounds, what do all the sheep weigh?

211. Arthur Dane bought 28 tons of iron at $37.50 a ton and 19 tons at $39.25 a ton, and sold the whole at $42.33 a ton. What did he gain?

212. A farmer had 18 acres of wheat, that yielded 43 bushels to the acre. How much is his wheat worth at $0.67 a bushel?

213. If a train of cars runs 37 miles an hour, how far will it run in 7 days, running 24 hours a day?

Find how much must be paid

214. For 17 horses at $325 each.
215. For 28 bushels of potatoes at 43 cents a bushel.
216. For 46 barrels of flour at $6.75 a barrel.
217. For 18 pounds of tea at 37 cents a pound.
218. For 45 yards of broadcloth at $2.25 a yard.
219. For 37 barrels of lime at $1.33 a barrel.
220. For 24 bushels of corn at 63 cents a bushel.
221. For 27 acres of land at $75 an acre.
222. For 35 tons of hay at $13.45 a ton.
223. For 57 baskets of peaches at 78 cents a basket.
224. For 23 tons of coal at $6.25 a ton.
225. For 15 cords of wood at $5.37 a cord.
226. For 27 yards of silk at $2.45 a yard.
227. For 75 barrels of apples at $1.95 a barrel.
228. For 425 yards of calico at 13 cents a yard.
229. For 1197 pounds of coffee at 27 cents a pound.
230. For 36 sheep at $2.25 a head.
231. For 42 cows at $75 a head.
232. For 197 histories at 94 cents a copy.
233. For 35 readers at 42 cents a copy.
234. For 357 arithmetics at 75 cents a copy.
235. For 107 geographies at 72 cents a copy.
236. For 118 grammars at 34 cents a copy.
237. For 64 dictionaries at $1.58 a copy.
238. For 143 bibles at $1.33 a copy.
239. For 83 yards of calico at 13 cents a yard.
240. For 27 pieces of ribbon at $1.25 a piece.
241. For 67 boxes of strawberries at 15 cents a box
242. For 26 rolls of paper at $0.67 a roll.
243. For 33 yards of flannel at $0.45 a yard.
244. For 54 yards of carpet at $1.12 a yard.
245. For 15 pairs of gloves at $0.75 a pair.
246. For 42 reams of paper at $2.21 a ream.
247. For 74 pairs of hose at $0.33 a pair.

$$72 \div 6 = 12$$
$$12 \div 3 = 4$$
$$6 \div 2 = 3$$

DIVISION.

53. ORAL EXERCISES.

1. How many apples at 2 cents each can I buy for 10 cents?

Solution. — As many as 2 cents are contained times in 10 cents; 2 cents are contained in 10 cents 5 times; hence, I can buy 5 apples for 10 cents.

2. If 4 oranges can be bought for 8 cents, how many cents are paid for each?

3. If a hat costs 2 dollars, how many hats can I buy for 14 dollars?

4. If oranges cost 3 cents each, how many can I buy for 18 cents?

5. A school of 24 pupils has 4 equal divisions. How many pupils are there in each division? How many would there be if there were 3 equal divisions?

6. If I set out 40 plants in 5 rows, how many plants will there be in each row?

7. If I wish to read 36 pages, and can read 6 pages an hour, in how many hours can I read them?

8. If you divide 56 pounds of flour among 7 poor families, how many pounds does each family receive?

9. At 5 cents a yard, how many yards of ribbon can be bought for 40 cents?

10. At $6 a ton, how many tons of coal can be bought for $42? For $24?

11. How many hours will it take to travel 44 miles at 4 miles an hour?

12. At 7 cents a quart, how many quarts of milk can be bought for 35 cents?

13. If two men 56 miles apart are approaching each other, one travelling 4 miles an hour and the other 3, in how many hours will they meet?

14. In how many weeks can a boy who saves $3 a week save $24? $30? $15?

15. In a gallon there are 4 quarts. How many gallons are there in 32 quarts? In 20? In 28?

16. Arthur gave 6 oranges to each of his sisters, and thus gave away 18 oranges. How many sisters had he?

17. If there are 7 days in a week, how many weeks are there in 49 days? In 63?

18. If I can buy 9 English walnuts for a cent, how much must I pay for 54?

19. If I divide 24 cents equally among 8 boys, how many will each receive?

20. When sugar is 9 cents a pound, how many pounds can be bought for 72 cents?

21. How many are $16 \div 4$? $20 \div 5$? $40 \div 8$? $21 \div 3$? $72 \div 8$? $49 \div 7$? $27 \div 3$?

22. How many are $81 \div 9$? $70 \div 7$? $66 \div 6$? $55 \div 5$? $63 \div 7$? $32 \div 4$?

23. Forty-eight are how many times 8? 4? 6? 12?

24. Seventy-two are how many times 12? 9? 6? 8?

54. Division is the process of finding how many times one number is contained in another, or of finding one of the equal parts of a number.

55. The **Dividend** is the number *to be divided.*

The **Divisor** is the number *by which to divide.*

The **Quotient** is the *number of times* the dividend contains the divisor.

If the dividend does not contain the divisor an *exact number of times*, the part of the dividend which is left is called the **Remainder.**

56. The *sign of division*, $\div$, indicates that the number before it is to be divided by the number after it; or division may be indicated by writing the divisor under the dividend, with a line between the dividend and the divisor; thus, $10 \div 5 = \frac{10}{5} = 2$, that is, 10 divided by 5 equals 2, or 5 in 10, 2 times.

57. WRITTEN EXERCISES.

25. Divide 948 by 4.

Divisor, 4) 948, Dividend.
Quotient, 237

The divisor 4 is contained in the 9 (hundreds) of the dividend 2 (hundreds) times, and 1 (hundred) remainder. This 2 we write as the hundreds, or left-hand figure, of the quotient; the 1 hundred remainder is equal to 10 tens, which added to the 4 tens make 14 tens; 4 is contained in 14 (tens), 3 (tens) times and 2 (tens) remainder. The 3 (tens) we write in tens' place in the quotient, and the 2 tens remainder we reduce to units, that is, call it 20 units, and adding it to the 8 units, we have 28 units; 28 units divided by 4 gives 7 units, which we write in units' place in the quotient, thus completing the division.

26. How many panes of glass in each window, if 12 windows have 144 panes?

27. How many garments can be made from 102 yards of cloth, if each garment requires 6 yards?

28. A man gave 648 dollars to be divided equally among his 4 children. How much did each receive?

29. John received 64 cents from his mother, 86 from his father, and 58 from his aunt. If tops cost 8 cents apiece, how many could he buy with his money?

30. How many plants can I buy for 80 cents, if each plant costs 5 cents?

31. In how many hours will a steamer go 918 miles, if it goes 9 miles in an hour?

32. If I have 108 dollars, how many coats can I buy at 6 dollars apiece? At 9 dollars apiece? At 12 dollars apiece?

33. If I have 84 cents, how many pounds of sugar can I buy at 6 cents a pound? At 7 cents? At 12 cents?

34. Divide 78.16 by 4.

4) 78.16
19.54, Ans.

The process is the same as in Ex. 25, but the decimal point must be placed between units and tenths.

35. Divide 72.4 by 4.

36. Divide 87.5 by 5.

37. Divide 247.98 by 3.

(38.)	(39.)	(40.)	(41.)	(42.)
6) 96	8) 17.6	5) 685	2) 97.4	9) 837
(43.)	(44.)	(45.)	(46.)	(47.)
4) 808	7) 861	6) 840	3) 516	8) 864

(48.) 15) 60

(49.) 12) 96

(50.) 13) 65

(51.) 14) 42

(52.) 13) 91

(53.) 7) 84756
Ans. 12108

(54.) 4) 765.88

(55.) 5) 58.765

(56.) 6) 83274

(57.) 7) 95431

(58.) 8) 34680

(59.) 9) 6538.77′

(60.) 11) 456874

(61.) 12) 2875.68

(62.) 9) 87658
Ans. 9739, and 7 Rem.

NOTE. This 7 remainder may be written $\frac{7}{9}$, read seven ninths.

(63.) 7) 57654
Ans. $8236\frac{2}{7}$

(64.) 9) 76345

58. ORAL EXERCISES.

65. If 8 pounds of sugar cost 56 cents, what is it a pound?

66. If 63 cents is divided equally among 9 boys, how many cents will each receive?

67. At 12 dollars a week, how many weeks will it take to earn 60 dollars?

68. At 7 cents a quart, how many quarts of berries can be bought for 42 cents?

69. When coal is $8 a ton, how many tons can be bought for $64?

70. If a boy on his bicycle can go 11 miles an hour, how many hours will it take him to go 44 miles?

71. If you can buy 5 marbles for a cent, how many cents must you pay for 45 marbles?

72. How many hours will it take a ship, sailing 8 miles an hour, to sail 72 miles?

73. At 9 cents a yard, how many yards of cotton cloth can I buy for 54 cents?

74. How many barrels of cranberries worth $8 a barrel can be bought for $56?

75. Richard had 20 peaches to divide equally among his 5 brothers. How many must he give to each?

76. How many yards of broadcloth worth $4 a yard can be bought for $36?

77. At 6 cents a quart, how many quarts of walnuts can be bought for 60 cents?

78. Divide 42 by 6; by 7.

79. How many 6's are there in 30? In 48? In 54?

80. Divide 72 by 8; by 9; by 6; by 12.

81. How many 7's in 35? In 49? In 28?

82. How many times 8 make 64? 48? 72?

83. $84 \div 7 = ?$ $66 \div 11 = ?$ $44 \div 4 = ?$ $36 \div 9 = ?$

84. How many 5's in 45? In 55? In 35?

85. Divide	15	27	28	18	32	44	33	36
by	5	3	4	6	8	11	11	9
86. Divide	42	21	18	27	32	15	16	24
by	7	3	3	9	4	3	4	6
87. Divide	36	48	42	40	40	44	42	56
by	4	8	7	5	8	4	6	7
88. Divide	72	66	63	49	60	81	96	99
by	8	6	9	7	12	9	8	9

59. WRITTEN EXERCISES.

89. Divide 7845 by 15.

```
15) 7845 (523
    75
    ---
     34
     30
    ---
     45
     45
    ---
```

In this example the divisor is so great that the work cannot be easily kept in mind, but is written out in full. The process is exactly the same as in Ex. 25.

90. Divide 17654 by 37.

```
37) 17654 (477
    148
    ---
     285
     259
    ---
      264
      259
    ---
        5, Remainder.
```

PROOF.

```
477, Quotient.
 37, Divisor.
----
3339
1431
   5, Remainder.
----
17654, Dividend.
```

(91.)	(92.)	(93.)	(94.)	(95.)
15) 450 (	13) 403 (	19) 836 (	16) 368 (	11) 616 (

(96.)	(97.)	(98.)	(99.)	(100.)
21) 294 (	24) 312 (	25) 300 (	18) 486 (	23) 529 (

101. Divide 9786 by 43; by 34; by 27; by 48.
102. Divide 5342 by 27; by 18; by 38; by 29.
103. Divide 7189 by 38; by 47; by 63; by 75.
104. Divide 2457 by 51; by 82; by 35; by 15.
105. Divide 7365 by 72; by 37; by 44; by 88.
106. Divide 4567 by 64; by 28; by 91; by 46.

107. $6432 \div 18 = ?$ $7816 \div 28 = ?$
108. $7186 \div 45 = ?$ $8432 \div 63 = ?$
109. $9275 \div 27 = ?$ $2794 \div 17 = ?$
110. $8357 \div 35 = ?$ $4632 \div 55 = ?$
111. $17461 \div 52 = ?$ $28341 \div 87 = ?$
112. $13287 \div 67 = ?$ $15715 \div 75 = ?$

113. A man worked 18 months and earned 306 dollars. How much did he receive a month?

114. A boy having 217 chestnuts gave 63 to his mother, and divided the rest among his 14 playmates. How many did each receive?

115. If a train goes 19 miles in an hour, how long will it take it to go 95 miles?

116. A man bought a farm containing 23 acres for 276 dollars. How much did an acre cost?

60. As removing a figure one place to the right divides it by ten, two places by a hundred, etc., therefore, to divide by 10, 100, 1000, or 1 with any number of ciphers annexed,

Rule.

Move the decimal point as many places to the left as there are ciphers in the divisor.

NOTE 1. In order to move the decimal point the required number of places to the left, it may be necessary to prefix ciphers. (See Ex. 125.)

NOTE 2. The figures at the right of the decimal point can be left standing as decimals, or written separately as the remainder.

117. Divide 144 by 10. Ans. 14.4, or 14 and 4 rem.
118. Divide 7863 by 10.
119. Divide 8436 by 100.
Ans. 84.36, or 84 and 36 rem.
120. Divide 5648 by 100.
121. Divide 489 by 10.

122. Divide 874 by 100.
123. Divide 1647 by 100.
124. Divide 2714 by 1000.
125. Divide 46 by 1000. **Ans.** 0.046
126. Divide 144 by 100.
127. Divide 4 by 1000.
128. Divide 8763 by 100.

61. ORAL EXERCISES.

129. If there are 4 quarts in a gallon, how many gallons are there in 28 quarts?

130. If John saves $5 a month from his earnings, how long will it take him to save $60?

131. George bought a bicycle for $40, agreeing to pay $4 every month until he paid the whole. How many months will it take him to pay for it?

132. If 7 days make a week, how many weeks are there in 63 days?

133. How many tons of hay worth $12 a ton will it take to pay for 9 barrels of flour worth $8 a barrel?

134. A merchant bought 6 tons of coal at $6 a ton, and paid for it with cloth at $4 a yard. How many yards did it take?

135. If 5 men can do a piece of work in 10 days, how long will it take 10 men to do the same work?

136. If 6 horses eat 12 tons of hay in a certain time, how many tons will 1 horse eat in the same time? How many will 8 horses eat?

137. If I give 10 yards of cloth for 8 tons of coal worth $5 a ton, what do I receive a yard for my cloth?

138. If 4 men can do a piece of work in 12 days, how many men will it take to do the same work in 8 days?

139. How many barrels of flour at $6 a barrel can be bought for $54? for $66?

140. How many pounds of raisins at 12 cents a pound can be bought for 96 cents? for 108 cents? for 144 cents?

141. If a man spends $9 a week, how long will it take him at the same rate to spend $45? $63? $81? $108?

142. When cherries are worth 12 cents a quart, how many quarts can be bought for $1.08? for $1.44?

143. How many pencils at 4 cents each can be bought for 32 cents? for 48 cents?

144. If one cord of wood costs $5, how many cords can be bought for $45? for $55? for $60?

145. A man paid 81 cents for pine-apples at 9 cents each. How many did he buy?

146. How many silk dresses of 12 yards each can be made from a piece of silk containing 108 yards?

147. If I receive $27 for 9 days' work, how much is that a day?

148. A woman paid 63 cents for milk at 7 cents a quart. How many quarts did she buy?

149. Bought 9 quarts of blackberries at 8 cents a quart, and paid for them in raisins at 12 cents a pound. How many pounds did it take?

150. If a man works 9 hours in a day, in how many days will he work 63 hours? 81 hours? 108 hours?

151. There are 8 quarts in a peck, how many pecks are there in 48 quarts? in 64 quarts? in 96 quarts?

152. A boy who works for 9 cents an hour, earned 72 cents. How many hours did he work?

62. WRITTEN EXERCISES.

153. Divide 459 by 30.

$3\emptyset)\ 45.9$
Ans. 15.3

As $30 = 3 \times 10$, we first divide 459 by 10, obtaining 45.9; then we divide 45.9 by 3, obtaining 15.3, Ans.

154. Divide 6849 by 90.

155. Divide 14378 by 170.

$17\emptyset)\ 1437|8\ (84$
136
77
68
98, Rem.

Dividing both divisor and dividend by 10, we have in the dividend 1437 and 8 remainder. Dividing 1437 by 17, we have 84 and 9 tens remainder. Adding the two remainders, the 9 tens and the 8 units, together, we have 98 as the full remainder.

$17\emptyset)\ 1437.8\ (84.576+$
136
77
68
98
85
130
119
110
102
8

In this operation we have divided both divisor and dividend by 10, as in Ex. 153, and then continued the division to thousandths. As there is still a remainder, we write + at the right of the quotient.

156. Divide 76420 by 20; by 200; by 40.

157. Divide 28350 by 900; by 90; by 50.

158. Divide 17463 by 30; by 300; by 330.

159. Divide 8432.76 by 20; by 400; by 40.

(160.)	(161.)	(162.)
8) 7854	5) 53265	4) 87328
(163.)	(164.)	(165.)
6) 23856	8) 394.832	7) 63764.4
(166.)	(167.)	(168.)
4) 28796	6) 437.628	9) 851238
(169.)	(170.)	(171.)
8) 52761.44	2) 8764.51	7) 13654.27
(172.)	(173.)	(174.)
5) 236780.2	6) 87634.23	30) 467850
(175.)	(176.)	(177.)
20) 85432	70) 76432.3	50) 63218.7
(178.)	(179.)	(180.)
60) 678123.6	80) 91287.68	90) 538764.3
(181.)	(182.)	(183.)
100) 326847	200) 81787.6	600) 216784.2
(184.)	(185.)	(186.)
500) 56173217	800) 279654.4	700) 176435
(187.)	(188.)	(189.)
900) 637486.2	500) 476531	300) 1267341

190. Divide 76435 by 25; by 16.
191. Divide 123564 by 17; by 14.
192. Divide 27832 by 19; by 13.
193. Divide 324817 by 35; by 19.
194. Divide 764213 by 42; by 18.
195. Divide 854.321 by 34; by 16.
196. Divide 642876 by 47; by 51.
197. Divide 876.432 by 220; by 35.
198. Divide 464721 by 110; by 111.
199. Divide 154286 by 39; by 49.
200. Divide 218775 by 27; by 270.
201. Divide 13644.12 by 53; by 35.
202. Divide 176842.2 by 17; by 63.
203. Divide 54371 by 29; by 290.
204. Divide 37126.4 by 34; by 44.
205. Divide 642137 by 75; by 74.
206. Divide 521.634 by 33; by 53.
207. Divide 872875 by 55; by 550.
208. Divide 3256.84 by 170; by 150.
209. Divide 654781 by 345; by 631.
210. Divide 6178.21 by 21; by 31.
211. Divide 764830 by 350; by 3500.
212. Divide 470320 by 303; by 202.
213. Divide 207640 by 420; by 402.
214. Divide 175046 by 501; by 510.
215. Divide 8465.87 by 270; by 702.
216. Divide 176430 by 92; by 902.
217. Divide 53276.2 by 530; by 420.
218. Divide 7648.76 by 760; by 670.
219. Divide 353847 by 271; by 743.
220. Divide one million twenty-five thousand six hundred forty-seven by three hundred fifty-four.
221. Divisor = 764; dividend = 3146.27; quotient = ?
222. How many cows at $31 each can be bought for $651?

223. Virginia contains 42450 square miles, and Rhode Island 1250. How many States as large as Rhode Island can be cut out of Virginia?

224. James Farr walked 351 miles in 27 days. How many miles did he walk a day?

225. The product of two numbers is 36594, and one of the numbers is 342, what is the other number?

226. Divide $13.11 equally among 19 boys; among 23 boys; among 57 boys.

227. California contains 158360 square miles, and Rhode Island 1250 square miles. How many States as large as Rhode Island can be made out of California?

228. $39039500 \div 2050 = ?$

229. For 71 cords of wood Frank Carter paid $372.75. How much did he pay a cord?

230. From Boston to Chicago by rail, the distance is 1037 miles. At 345 miles a day, how many days will it take to go from Boston to Chicago?

231. A pipe discharges 87 gallons in an hour. How many hours will it take the pipe to empty a cistern containing 2784 gallons?

232. How many cars each carrying 56 sheep will it take to carry 4032 sheep?

233. What number multiplied by two hundred thirty-four will give three thousand nine hundred seventy-eight?

234. William Dunn paid $4.73 for a piece of sheeting containing 43 yards. What did he pay a yard?

235. How many barrels of flour worth $6.75 a barrel should be given in exchange for 15 tons of hay worth $18.90 a ton?

236. Product = 88704, multiplicand = 7392, multiplier = ?

Find the price of one bushel, one pound, etc.,

237. If 19 bushels of potatoes cost $8.74.
238. If 45 pounds of maple sugar cost $5.40.
239. If 36 yards of Hamburg cost $5.04.
240. If 18 pairs of gloves cost $31.50.
241. If 87 barrels of apples cost $182.70.
242. If 34 cords of wood cost $147.90.
243. If 62 baskets of peaches cost $45.26.
244. If 49 acres of land cost $5733.
245. If 73 barrels of lime cost $83.95.
246. If 117 pounds of tea cost $62.01.
247. If 35 horses cost $5705.
248. If 14 yards of lace cost $6.02.
249. If 43 sheep cost $94.60.
250. If 27 barrels of flour cost $139.05.
251. If 28 yards of cloth cost $48.44.
252. If 56 bushels of corn cost $37.52.
253. If 47 tons of hay cost $575.75.
254. If 16 tons of coal cost $85.92.
255. If 32 yards of silk cost $59.84.
256. If 27 yards of calico cost $3.24.
257. If 19 cows cost $1197.
258. If 57 pounds of coffee cost $16.53.
259. If 24 barrels of corned-beef cost $208.56.
260. If 63 yards of cotton cost $11.34.
261. If 42 tons of steel rails cost $1890.
262. If 435 pounds of butter cost $160.95.
263. If 85 yards of carpet cost $138.55.
264. If 42 rolls of paper cost $15.54.
265. If 28 yards of flannel cost $15.40.
266. If 34 pairs of hose cost $9.52.
267. If 18 yards of velvet cost $12.06.
268. If 23 reams of note-paper cost $28.75.
269. If 17 reams of letter-paper cost $29.75.
270. If 75 pounds of raisins cost $9.75.

63. ORAL EXERCISES.

1. A farmer bought a cow for $50. How many ten-dollar bills will pay for it? How many five-dollar bills?

2. Willie sold 3 papers on Monday, 5 on Tuesday, and 8 on Wednesday. He sold his papers at 4 cents a copy. How many cents did he receive?

3. A lady having $50 paid $27 for a dress, $9 for a shawl, and $5 for a pair of shoes. How much money had she left?

4. Mrs. Barker bought a half pound of tea at 60 cents a pound, and a dozen eggs at 20 cents a dozen. How much did she pay in all?

5. At the rate of 3 apples for 5 cents, how many apples can be bought for 20 cents?

6. If a pupil recites 5 lessons a day, how many lessons will he recite in 7 days? in 9 days? in 11 days?

7. Willie sold 5 quarts of chestnuts at 12 cents a quart, and bought a book for 35 cents, and a pound of candy for 25 cents. How much of this money had he left?

8. A farmer sold 4 barrels of apples at $1.50 a barrel, and 4 cans of milk at 50 cents a can. How much money did he receive?

9. One man can do a certain piece of work in 54 days. How long will it take 6 men to do it? 9 men?

10. A man having $100, paid $65 for a cow, $12 for a pig, and $5 for a sheep. How much money had he left?

11. Mr. Snow paid $3.50 for a hat, $4 for pair of boots, and 50 cents for a silk handkerchief. How much did he pay for all?

12. A man built a piece of wall in 36 days. If he worked 6 days a week, how many weeks was he building the wall?

13. A class of 12 scholars need new writing-books. What will it cost to supply the class at 11 cents a book? at 7 cents? at 10 cents? at 8 cents? at 9 cents? at 6 cents?

14. Fred sold 13 papers on Thursday, 11 on Friday, and 15 on Saturday. How many papers did he sell on the three days?

15. A lady paid 48 cents for 12 pencils. How much did she pay apiece?

16. How much are 5 cords of wood worth at $8 a cord? at $5 a cord? at $7 a cord? at $4 a cord? at $6 a cord? at $9 a cord?

17. Mr. Snow paid $48 for 8 tons of coal. How much did he pay a ton?

18. A boy paid 12 cents for a slate, 4 cents for a pencil, and 14 cents for a writing-book. How much did he pay for all?

19. When chestnuts are worth 11 cents a quart, what are 9 quarts worth? 7 quarts? 8 quarts? 5 quarts?

20. In a farm containing 37 acres only 25 acres are cleared land. How many acres are not cleared?

21. When raisins are 10 cents a pound, how many pounds can I buy for 90 cents? for 110 cents? for 80 cents? for 120 cents? for 70 cents? for 60 cents? for 50 cents?

22. A farmer sold 9 barrels of apples at $3 a barrel. How much should he receive for them?

23. A clerk sold from a piece of broadcloth containing 27 yards, 4 yards to one customer, 3 yards to another, 7 yards to another, and 9 yards to another. How many yards remained in the piece?

64. WRITTEN EXERCISES.

24. Add $56.24, $27.45, $99.84, $12.13.

25. By the U. S. census of 1880, the product of all the boot and shoe factories was valued at $166 050 354. That of Massachusetts alone was $95 900 510. Of how much greater value were these manufactures in Massachusetts than in all the other States combined?

26. A gentleman paid $14 for the cloth for a suit of clothes, $1.95 for trimmings, $3 for cutting, and $9 for making. What did his suit cost him?

27. What will 125 arithmetics cost at 40 cents each?

28. A drover having 128 sheep sold 35 to one man, and 32 to another. How many sheep did he have left?

29. In five days Mr. Brown sold 14 cans, 19 cans, 13 cans, 12 cans, and 15 cans of milk. How many cans did he sell in the five days? How much was the milk worth at 32 cents a can?

30. What will it cost to supply 50 scholars with dictionaries at 50 cents a copy?

31. If it costs Mr. Clark 60 cents a day for car-fare, and last month it cost him $15.60, how many days did he ride?

32. A man paid in two years $512 for freight; the last year he paid $312.50. How much did he pay the first year?

33. What will 25 yards of carpeting cost at $1.50 a yard?

34. If my income is $1250, and I pay $250 for rent and $850 for other expenses, how much of my income have I left at the end of the year?

35. A milkman bought 210 cans of milk in 14 days. How many cans did he buy a day on the average?

36. What will 25 yards of silk cost at $2.50 a yard?

37. A grocer bought 28 barrels, 35 barrels, 42 barrels, and 71 barrels of flour. How many barrels in all did he buy?

38. How many bushels are there in 5 bins of corn containing 55 bushels each?

39. James attended school 196 days one year, and 134 days the next. How many more days did he attend school one year than the other?

40. A bookseller paid $300 for arithmetics at 75 cents a copy. How many copies did he buy?

41. What will 8 barrels of flour cost at $6.50 a barrel? at $7.25? at $8.75?

42. A fruit-dealer having 1000 oranges sold 785. How many had he left?

43. William Stone bought 6 collars at 15 cents each, a pair of cuff-buttons for 85 cents, and a pair of cuffs for 20 cents. How much did he pay for all?

44. A farmer paid $15.72 for grain in January, $19.83 in February, $13.85 in March, and $29.05 in April. How much did he pay for grain in the four months?

45. A grocer paid $32.76 for coffee at 28 cents a pound, and sold it at 35 cents a pound. How much did he make?

46. If a bushel of apples weighs 50 pounds, what is the weight of 75 bushels of apples? 85 bushels? 95 bushels?

47. A teacher bought for his class 38 arithmetics at 75 cents each, 25 grammars at 38 cents each, 36 writing-books at 12 cents each. How much did he pay for all?

48. Mrs. Smith took the first week in January 10 quarts of milk, the second week 16 quarts, the third week 11 quarts, and the fourth week 15 quarts, at 7 cents a quart. She paid for the milk with eggs at 24 cents a dozen. How many dozen did it take?

49. Ellen Alden's mother bought for her birthday party 3 pounds of candy at 25 cents a pound, 6 pounds of mixed nuts at 15 cents a pound, 3 dozen oranges at 35 cents a dozen, 2 pounds of raisins at 12 cents a pound, 8 quarts of ice cream at 40 cents a quart. How much did these things cost?

50. A strawberry-bed yielded on the first picking 122 quarts, on the second 137 quarts, on the third 150 quarts, and on the fourth 177 quarts. The berries were sold at 16 cents a quart. For how much were they sold? Since there are 32 quarts in a bushel, how many bushels were picked?

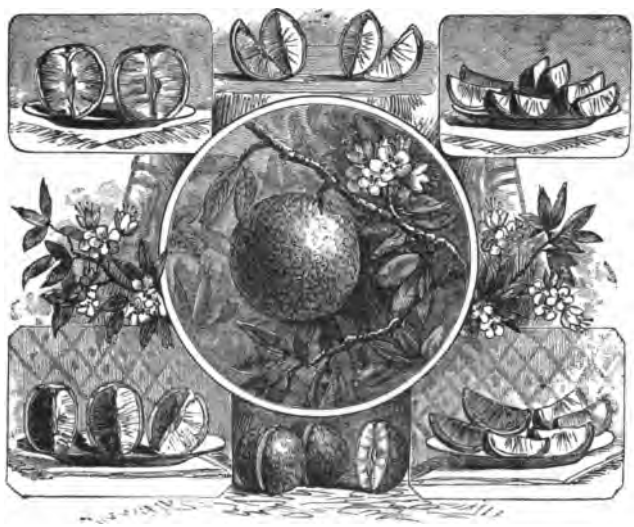
51. How long will it take a man who speaks 125 words a minute to deliver an address covering 25 pages, each page containing 30 lines and each line 9 words?

52. How long will it take to go by car from Philadelphia to San Francisco if the average rate is 35 miles an hour and the distance 3220 miles?

53. The President's salary is $50 000 a year. How much of this can he spend each year, and yet save $45358 in 4 years, his term of office?

54. A field of 11 acres yielded 17.5 bushels of wheat an acre. If the labor and seed cost $175.50, and the wheat brought $1.05 a bushel, how much profit was made from the field?

55. How many pounds of butter at 37 cents a pound must be given for 32 pounds of sugar at 6 cents a pound, 8 pounds of coffee at 32 cents a pound, and a barrel of flour at $6.25?



FRACTIONS.

65. If anything, as an orange, is divided into two equal parts, each of these equal parts is called *one half*, and is written $\frac{1}{2}$.

If the orange is divided into three equal parts, each of these parts is called *one third*, written $\frac{1}{3}$; two of these parts are called *two thirds*, written $\frac{2}{3}$.

If the unit is divided into four equal parts, each of these parts is called *one fourth*, written $\frac{1}{4}$; two of these parts are called *two fourths*, written $\frac{2}{4}$; three, *three fourths*, $\frac{3}{4}$; and so on. These expressions, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{3}{4}$, etc., are called fractions.

66. A **Fraction** is one or more of the equal parts of a unit.

67. The number below the line shows *into how many equal parts the unit is divided*, and is called the **Denominator**, because it *denominates* or *gives name* to the parts; thus, if a unit is divided into three equal parts, each part is one *third;* if into eight, each part is one *eighth;* etc.

68. The number above the line is called the **Numerator**, because it *numerates* or *numbers* the parts *taken.*

69. The numerator and the denominator are the **Terms** of the fraction.

70. EXERCISES.

1. Write in figures three fourths; four fifths; three eighths; four ninths; five sevenths; six ninths; seven tenths.

2. Write in figures seven ninths; eight elevenths; nine thirteenths.

3. Write in figures six seventeenths; sixteen thirty-fifths; fourteen fifteenths.



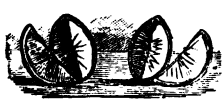
4. How many halves of an orange make a whole orange?

5. How many thirds of an orange make a whole orange?



6. Which is greater, one half or one third of the same thing?

7. How many fourths of an orange make a whole orange? How many fourths of an orange make half an orange?



8. How many sixths of an orange make a whole orange? How many sixths in half an orange?



9. How many eighths of an orange make a whole orange? How many eighths in half an orange? in a quarter?



71. To distinguish them from fractions, whole numbers are called **Integers**, or **Integral Numbers**.

72. A fraction is only an expression of division (Art. 56), the numerator being the dividend, and the denominator the divisor. Hence,

(a.) *The value of a fraction is the quotient of the numerator divided by the denominator.* Thus,

$$\frac{12}{4} = 12 \div 4 = 3.$$

(b.) *Multiplying the numerator multiplies the fraction, dividing the numerator divides the fraction; multiplying the denominator divides the fraction, dividing the denominator multiplies the fraction.* Thus,

$$\frac{2}{5} \times 2 = \frac{4}{5}; \quad \frac{4}{5} \div 2 = \frac{2}{5}.$$

and $$\frac{1}{2} \div 2 = \frac{1}{4}; \quad \frac{1}{4} \times 2 = \frac{1}{2}.$$

(c.) *Multiplying or dividing both numerator and denominator of a fraction by the same number does not change the value of the fraction.* Thus,

$$\frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}; \text{ or, } \frac{6}{10} = \frac{6 \div 2}{10 \div 2} = \frac{3}{5}.$$

(See also illustrations below.)

REDUCTION OF FRACTIONS.

73. Reduction of Fractions is changing the *terms* without changing the *value* of a fraction.

74. To reduce a fraction to its lowest terms.

A fraction is in its *lowest terms* when its terms are the least integers that will express its value.



Of this line the two fourths are the same as one half.



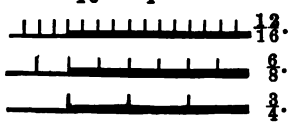
Of this line the six tenths are the same as the three fifths.

1. Reduce $\frac{12}{16}$ to its lowest terms.

$\frac{12}{16} = \frac{6}{8} = \frac{3}{4}$, Ans.

or,

$\frac{12}{16} = \frac{3}{4}$, Ans.



Dividing both terms of $\frac{12}{16}$ by 2, we have (Art. 72, c) $\frac{12}{16} = \frac{6}{8}$; dividing both terms of $\frac{6}{8}$ by 2, we have $\frac{6}{8} = \frac{3}{4}$. Or dividing both terms of $\frac{12}{16}$ by 4, we have at once $\frac{12}{16} = \frac{3}{4}$. As 3 and 4 have no common factor, $\frac{12}{16}$ is reduced to its lowest terms, $\frac{3}{4}$. The divided lines also show $\frac{12}{16} = \frac{6}{8} = \frac{3}{4}$.

75. ORAL EXERCISES.

2. Reduce to their lowest terms $\frac{2}{6}$; $\frac{3}{6}$; $\frac{4}{6}$; $\frac{4}{8}$; $\frac{3}{9}$; $\frac{2}{10}$; $\frac{4}{10}$; $\frac{5}{10}$; $\frac{6}{10}$; $\frac{8}{10}$.

3. Reduce to their lowest terms $\frac{8}{12}$; $\frac{4}{12}$; $\frac{6}{12}$; $\frac{8}{12}$; $\frac{9}{12}$; $\frac{10}{12}$; $\frac{3}{15}$; $\frac{5}{15}$; $\frac{6}{15}$; $\frac{9}{15}$.

4. Reduce to their lowest terms $\frac{2}{16}$; $\frac{4}{16}$; $\frac{8}{16}$; $\frac{10}{16}$; $\frac{14}{16}$; $\frac{2}{18}$; $\frac{3}{18}$; $\frac{4}{18}$; $\frac{6}{18}$; $\frac{9}{18}$.

5. Change $\frac{1}{3}$ to sixths; to ninths; to twelfths.

6. Change $\frac{2}{5}$ to tenths; to fifteenths; to twentieths.

76. WRITTEN EXERCISES.

Reduce to their lowest terms:

7. $\frac{18}{72}$.	11. $\frac{28}{35}$.	15. $\frac{24}{36}$.	19. $\frac{35}{49}$.
8. $\frac{25}{75}$.	12. $\frac{27}{45}$.	16. $\frac{33}{44}$.	20. $\frac{48}{72}$.
9. $\frac{17}{51}$.	13. $\frac{21}{28}$.	17. $\frac{36}{40}$.	21. $\frac{45}{75}$.
10. $\frac{15}{25}$.	14. $\frac{14}{21}$.	18. $\frac{16}{24}$.	22. $\frac{24}{28}$.

77. To reduce a whole or mixed number to an improper fraction.

78. A *mixed number* is a whole number and a fraction. Thus, $4\frac{2}{3}$ is a mixed number, as it consists of the whole number 4, with the fraction $\frac{2}{3}$.

79. An *improper fraction* is a fraction whose numerator equals or exceeds its denominator; as $\frac{4}{4}$, or $\frac{8}{5}$.

80. ORAL EXERCISES.



23. In 2 apples how many halves are there?

Solution. — As there are two halves in one apple, in 2 apples there would be 2 times 2 halves, or 4 halves; $\frac{4}{2}$, Ans.

24. How many thirds are there in 3 apples and $\frac{2}{3}$ of an apple?

Solution. — As in one apple there are 3 thirds, in 3 apples there are 3 times 3 thirds, or 9 thirds; 9 thirds and 2 thirds are 11 thirds; $\frac{11}{3}$, Ans.



25. How many halves of an orange are there in two oranges and a half?

26. How many fifths are there in 3 oranges and $\frac{2}{5}$ of an orange? in 4 oranges and $\frac{3}{5}$ of an orange? in 6 oranges and $\frac{4}{5}$ of an orange?

27. How many quarters are there in \$5? in $\$4\frac{3}{4}$? in $\$6\frac{1}{2}$? in $\$7\frac{1}{4}$? in $\$8\frac{1}{2}$?

28. Reduce 4 to a fraction whose denominator is 5.

29. Reduce 6 to a fraction whose denominator is 4.

30. Reduce 5 to a fraction whose denominator is 1.

Ans. $\frac{5}{1}$.

NOTE. Any integer may be expressed as a fraction by writing 1 under it as its denominator.

31. Reduce 12 to a fraction whose denominator is 1; whose denominator is 2; 3.

32. Reduce $\frac{3}{4}$ to a fraction whose denominator is 20; whose denominatior is 12; 16; 24.

33. Reduce to improper fractions in their lowest terms $1\frac{2}{4}$; $2\frac{3}{5}$; $2\frac{4}{6}$; $2\frac{3}{7}$; $3\frac{4}{5}$; $3\frac{2}{6}$; $3\frac{1}{3}$; $4\frac{1}{2}$; $4\frac{2}{3}$; $4\frac{4}{6}$; $4\frac{4}{5}$; $5\frac{1}{3}$; $5\frac{3}{5}$; $5\frac{2}{4}$; $5\frac{1}{6}$; $5\frac{2}{6}$; $6\frac{1}{3}$; $6\frac{2}{6}$; $7\frac{1}{2}$; $8\frac{3}{4}$.

81. WRITTEN EXERCISES.

Reduce the following numbers to improper fractions:

34. $23\frac{3}{8}$.
35. $18\frac{5}{6}$.
36. $19\frac{2}{7}$.
37. $27\frac{5}{9}$.
38. $14\frac{1}{3}$.
39. $29\frac{2}{5}$.
40. $37\frac{2}{9}$.
41. $43\frac{1}{7}$.
42. $55\frac{2}{5}$.
43. $64\frac{3}{8}$.
44. $75\frac{2}{5}$.
45. $73\frac{1}{5}$.
46. $25\frac{2}{5}$.
47. $18\frac{7}{9}$.
48. $28\frac{4}{5}$.
49. $37\frac{2}{7}$.

82. To reduce an improper fraction to a whole or mixed number.

83. ORAL EXERCISES.

50. How many dollars are there in 8 quarters of a dollar?

Solution. — As 4 quarters make 1 dollar, there are as many dollars in 8 quarters as 4 is contained times in 8, that is, 2, Ans.

51. How many dollars are there in 10 quarters of a dollar? in 11? in 12? in 15?

52. If John saves half a dollar a week, how many dollars will he save in 9 weeks? in 12 weeks? in 17 weeks?

53. Reduce to integers or mixed numbers $\frac{12}{2}$; $\frac{15}{3}$; $\frac{9}{2}$; $\frac{8}{3}$; $\frac{14}{7}$; $\frac{18}{5}$; $\frac{20}{7}$; $\frac{23}{11}$; $\frac{24}{5}$; $\frac{25}{6}$; $\frac{25}{8}$; $\frac{28}{4}$; $\frac{26}{7}$; $\frac{28}{4}$; $\frac{28}{5}$; $\frac{28}{6}$; $\frac{30}{6}$; $\frac{30}{5}$; $\frac{30}{7}$; $\frac{30}{8}$.

84. WRITTEN EXERCISES.

Reduce the following fractions to whole or mixed numbers:

54. $\frac{145}{5}$. 58. $\frac{417}{4}$. 62. $\frac{541}{8}$. 66. $\frac{171}{11}$.
55. $\frac{237}{8}$. 59. $\frac{232}{7}$. 63. $\frac{787}{6}$. 67. $\frac{497}{10}$.
56. $\frac{241}{8}$. 60. $\frac{817}{9}$. 64. $\frac{834}{5}$. 68. $\frac{284}{9}$.
57. $\frac{217}{11}$. 61. $\frac{145}{10}$. 65. $\frac{228}{9}$. 69. $\frac{414}{4}$.

ADDITION OF FRACTIONS.

85. ORAL EXERCISES.

70. John had 2 quarters of a dollar and his mother gave him 1 quarter of a dollar. How many quarters of a dollar did he then have? $\frac{2}{4} + \frac{1}{4} = ?$

71. If you have half a dollar and then earn a quarter, how much money will you have?

$$\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = ?$$

72. How many are $\frac{2}{3}$ and $\frac{1}{3}$?
73. How many are $\frac{2}{7}$ and $\frac{2}{7}$?
74. How many are $\frac{1}{3}$ and $\frac{2}{3}$? $\frac{1}{3} + \frac{2}{3} = \frac{2}{3} + \frac{2}{3} = ?$
75. How many are $\frac{2}{5}$ and $\frac{2}{5}$?
76. Add $\frac{4}{5}$ and $\frac{8}{10}$ together. $\frac{4}{5} + \frac{8}{10} = \frac{8}{10} + \frac{8}{10} = ?$
77. Add $\frac{2}{4}$ and $\frac{1}{8}$ together.
78. Add $\frac{4}{6}$ and $\frac{5}{6}$ together.
79. Add $\frac{2}{3}$ and $\frac{2}{4}$ together. $\frac{2}{3} + \frac{2}{4} = \frac{8}{12} + \frac{6}{12} = ?$
80. Add $\frac{1}{3}$ and $\frac{1}{4}$ together.
81. Add $\frac{2}{5}$ and $\frac{2}{3}$ together; $\frac{2}{5}$ and $\frac{1}{3}$; $\frac{4}{5}$ and $\frac{1}{3}$.
82. Add $\frac{1}{2}$ and $\frac{2}{3}$ together; $\frac{1}{3}$ and $\frac{1}{5}$; $\frac{2}{6}$ and $\frac{5}{6}$.
83. Add $\frac{2}{3}$ and $\frac{2}{5}$ together; $\frac{1}{3}$ and $\frac{2}{5}$; $\frac{1}{5}$ and $\frac{3}{10}$.
84. Add $\frac{3}{5}$ and $\frac{2}{8}$ together; $\frac{2}{5}$ and $\frac{1}{8}$; $\frac{4}{5}$ and $\frac{1}{8}$.
85. Add $\frac{4}{5}$ and $\frac{7}{10}$ together; $\frac{2}{7}$ and $\frac{2}{5}$; $\frac{2}{4}$ and $\frac{2}{8}$.

86. WRITTEN EXERCISES.

86. Add $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ together.

$\frac{1}{2} = \frac{6}{12}$
$\frac{1}{3} = \frac{4}{12}$
$\frac{1}{4} = \frac{3}{12}$
Ans. $\frac{13}{12} = 1\frac{1}{12}$.

To add these fractions they must have like denominators; halves, thirds, and fourths can be reduced to twelfths.

87. When fractions have like denominators they are said to have a *common denominator.* If this common denominator is the least possible the fractions are said to have their *least common denominator.*

88. Two or more fractions can be reduced to fractions having a common denominator *by multiplying both terms of each fraction* by the product of the other denominators.

87. Add $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{2}{5}$ together.

$\frac{1}{2} = \frac{15}{30}$
$\frac{2}{3} = \frac{20}{30}$
$\frac{2}{5} = \frac{12}{30}$
Ans. $\frac{47}{30} = 1\frac{17}{30}$.

Multiplying both terms of $\frac{1}{2}$ by 3×5 (the product of the other denominators) we have $\frac{15}{30}$; multiplying both terms of $\frac{2}{3}$ by 2×5, we have $\frac{20}{30}$; multiplying both terms of $\frac{2}{5}$ by 2×3, we have $\frac{12}{30}$. $\frac{15}{30} + \frac{20}{30} + \frac{12}{30} = \frac{47}{30} = 1\frac{17}{30}$, Ans.

88. Add $\frac{2}{3}$, $\frac{3}{5}$, and $\frac{1}{6}$ together; $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{5}{6}$.
89. Add $\frac{1}{4}$, $\frac{2}{5}$, and $\frac{1}{8}$ together; $\frac{3}{4}$, $\frac{2}{5}$, and $\frac{3}{8}$.
90. Add $\frac{3}{7}$ and $\frac{2}{5}$ together; $\frac{2}{7}$, $\frac{4}{5}$, and $\frac{3}{10}$.
91. Add $\frac{1}{6}$, $\frac{1}{9}$, and $\frac{1}{3}$ together; $\frac{5}{6}$, $\frac{4}{9}$, and $\frac{2}{3}$.
92. Add $\frac{3}{10}$, $\frac{4}{9}$, and $\frac{1}{5}$ together; $\frac{7}{10}$, $\frac{2}{9}$, and $\frac{3}{5}$.

93. $\frac{3}{10} + \frac{2}{3} + \frac{5}{6} = ?$
94. $\frac{4}{7} + \frac{1}{3} + \frac{5}{21} = ?$
95. $\frac{3}{8} + \frac{2}{5} + \frac{5}{12} = ?$
96. $\frac{3}{5} + \frac{1}{4} + \frac{5}{8} = ?$
97. $\frac{5}{9} + \frac{2}{4} + \frac{5}{12} = ?$
98. $\frac{7}{8} + \frac{1}{4} + \frac{3}{16} = ?$

99. Add $16\frac{1}{3}$, $25\frac{1}{4}$, and $32\frac{2}{3}$ together.

$16\frac{1}{3} = 16\frac{4}{12}$
$25\frac{1}{4} = 25\frac{3}{12}$
$32\frac{2}{3} = 32\frac{8}{12}$
$74\frac{5}{12}$, Ans.

$\frac{4}{12} + \frac{3}{12} + \frac{8}{12} = \frac{17}{12} = 1\frac{5}{12}$.

100. Add $27\frac{2}{3}$, $39\frac{1}{4}$, and $75\frac{1}{2}$ together.

101. $8\frac{1}{5} + 7\frac{2}{4} + 12\frac{5}{10} = ?$

102. $9\frac{2}{3} + 27\frac{2}{4} + 18\frac{1}{6} = ?$

103. $47\frac{5}{6} + 83\frac{1}{2} + 273\frac{1}{3} = ?$

104. A man sells 5 cows. For the first he gets \$$28\frac{1}{4}$, for the second \$$35\frac{1}{2}$, for the third \$$37\frac{3}{4}$, for the fourth \$$41\frac{1}{2}$, and for the fifth \$$45\frac{3}{4}$. How much does he receive for all?

SUBTRACTION OF FRACTIONS.

89. ORAL EXERCISES.

105. Sarah had 3 quarters of a dollar and spent 1 quarter. How many quarters did she have left?

$\frac{3}{4} - \frac{1}{4} = ?$

106. If you have half a dollar and give away a quarter, how much will you have left?

$\frac{1}{2} - \frac{1}{4} = \frac{2}{4} - \frac{1}{4} = ?$

107. From $\frac{7}{9}$ take $\frac{4}{9}$.

108. From $\frac{5}{8}$ take $\frac{3}{8}$.

109. Take $\frac{4}{7}$ from $\frac{6}{7}$.

110. Take $\frac{5}{12}$ from $\frac{7}{12}$.

111. Take $\frac{1}{6}$ from $\frac{1}{3}$. $\frac{1}{3} - \frac{1}{6} = \frac{2}{6} - \frac{1}{6} = ?$

112. $\frac{2}{3} - \frac{3}{5} = ?$ $\frac{3}{4} - \frac{1}{5} = ?$ $\frac{2}{5} - \frac{1}{10} = ?$ $\frac{5}{6} - \frac{1}{3} = ?$ $\frac{3}{4} - \frac{2}{8} = ?$

113. If Charles has $\frac{3}{5}$ of a dollar and spends $\frac{3}{10}$ of a dollar, how much has he left?

90. WRITTEN EXERCISES.

114. From $\frac{8}{9}$ take $\frac{3}{5}$.

$$\frac{8}{9} - \frac{3}{5} = \frac{40}{45} - \frac{27}{45} = \frac{13}{45}, \text{ Ans.}$$

115. From $\frac{3}{8}$ take $\frac{8}{13}$.

116. $\frac{7}{12} - \frac{2}{6} = ?$

117. $\frac{8}{9} - \frac{4}{7} = ?$

118. $\frac{8}{15} - \frac{2}{7} = ?$

119. $\frac{5}{12} - \frac{5}{18} = ?$

120. $\frac{8}{24} - \frac{8}{40} = ?$

121. $\frac{7}{15} - \frac{3}{10} = ?$

122. $\frac{9}{11} - \frac{2}{3} = ?$

123. $\frac{8}{9} - \frac{5}{25} = ?$

124. $\frac{15}{25} - \frac{9}{40} = ?$

125. $\frac{28}{35} - \frac{14}{49} = ?$

126. From $18\frac{1}{4}$ take $15\frac{1}{5}$.

$$\begin{aligned} 18\tfrac{1}{4} &= 18\tfrac{5}{20} \\ 15\tfrac{1}{5} &= 15\tfrac{4}{20} \\ \hline & 3\tfrac{1}{20}, \text{ Ans.} \end{aligned}$$

127. From $28\frac{3}{5}$ take $19\frac{2}{3}$.

$$\begin{aligned} 28\tfrac{3}{5} &= 28\tfrac{9}{15} \\ 19\tfrac{2}{3} &= 19\tfrac{10}{15} \\ \hline & 8\tfrac{14}{15}, \text{ Ans.} \end{aligned}$$

Having reduced the $\frac{3}{5}$ and the $\frac{2}{3}$ to fifteenths, as we cannot take $\frac{10}{15}$ from $\frac{9}{15}$ we take a unit from the 8 units (of 28) and reduce it to fifteenths; adding this to $\frac{9}{15}$ we have $\frac{24}{15}$; $\frac{24}{15} - \frac{10}{15} = \frac{14}{15}$; then we proceed as in simple subtraction.

128. $285\frac{3}{8} - 147\frac{3}{4} = ?$

129. $1347\frac{7}{8} - 843\frac{1}{4} = ?$

130. $2568\frac{4}{9} - 1817\frac{3}{4} = ?$

131. $343\frac{3}{5} - 216\frac{6}{7} = ?$

132. $1276\frac{1}{3} - 759\frac{3}{5} = ?$

133. $3456\frac{3}{7} - 2871\frac{5}{6} = ?$

MULTIPLICATION OF FRACTIONS.

91. ORAL EXERCISES.

134. If a yard of cloth costs $\$\frac{1}{4}$, what will 3 yards cost?

Solution. — If one yard costs one quarter of a dollar, 3 yards will cost 3 times 1 quarter, or 3 quarters of a dollar.

$\$\frac{1}{4} \times 3 = \$\frac{3}{4}$, Ans. (Art. 72 b.)

$\frac{2}{5} \times 3 = ?$ $\frac{2}{3} \times 4 = ?$ $\frac{4}{7} \times 5 = ?$

135. John has $\frac{1}{3}$ of a dollar and Mary 4 times as much. What part of a dollar has Mary?

$\$\frac{1}{3} \times 4 = \$\frac{1}{2}$, Ans. (Art. 72, b.)

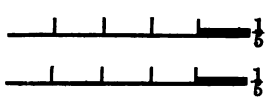
136. $\frac{1}{5} \times 4 = ?$ 140. $\frac{2}{3} \times 2 = ?$ 144. $\frac{2}{7} \times 5 = ?$

137. $\frac{3}{5} \times 2 = ?$ 141. $\frac{4}{7} \times 3 = ?$ 145. $\frac{3}{10} \times 7 = ?$

138. $\frac{5}{6} \times 3 = ?$ 142. $\frac{2}{9} \times 3 = ?$ 146. $\frac{3}{8} \times 4 = ?$

139. $\frac{5}{12} \times 6 = ?$ 143. $\frac{7}{11} \times 7 = ?$ 147. $\frac{5}{8} \times 4 = ?$

148. Henry and James each had 1 dollar, and each gave $\frac{1}{5}$ of what he had to William. What part of a dollar did William receive? $\frac{1}{5}$ of $\$2 = ?$



This illustration shows that $\frac{1}{5}$ of 2 equal things = $\frac{2}{5}$ of either one of them, or that $\frac{1}{3}$ of $2 = \frac{2}{3}$ of 1.

Does $\frac{1}{2}$ of 3 equal 3 multiplied by $\frac{1}{2}$?

149. What is $\frac{1}{3}$ of 2? $2 \times \frac{1}{3} = ?$ What is $\frac{1}{3}$ of 5? $5 \times \frac{1}{3} = ?$ What is $\frac{1}{2}$ of 7? $7 \times \frac{1}{2} = ?$ $\frac{1}{2} \times 7 = ?$

150. If William has $\frac{1}{2}$ of a dollar and gives away $\frac{1}{2}$ of it, what part of a dollar does he give away?

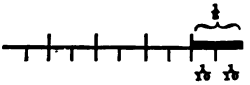
$\frac{1}{2}$ of $\frac{1}{2} = ?$



This illustration shows that $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4}$.

151. If Oliver has $\frac{1}{5}$ of a dollar and gives away $\frac{1}{2}$ of it, what part of a dollar does he give away?

$\frac{1}{2}$ of $\frac{1}{5} = ?$



This illustration shows that $\frac{1}{2}$ of $\frac{1}{5} = \frac{1}{10}$.

152. A merchant had 7 barrels of flour and sold $\frac{1}{5}$ of them. How many barrels did he sell?

153. What is $\frac{1}{2}$ of $\frac{1}{3}$? $\frac{1}{2}$ of $\frac{2}{3}$? $\frac{1}{2}$ of $\frac{1}{4}$? $\frac{1}{2}$ of $\frac{2}{4}$? $\frac{1}{2}$ of $\frac{3}{4}$? $\frac{1}{2}$ of $\frac{1}{5}$? $\frac{1}{2}$ of $\frac{2}{5}$? $\frac{1}{2}$ of $\frac{3}{5}$? $\frac{1}{2}$ of $\frac{4}{5}$? $\frac{1}{2}$ of $\frac{1}{6}$?

154. What is $\frac{1}{3}$ of $\frac{1}{7}$? $\frac{1}{3}$ of $\frac{2}{7}$? $\frac{1}{3}$ of $\frac{5}{7}$? $\frac{1}{3}$ of $\frac{6}{7}$? $\frac{1}{3}$ of $\frac{1}{3}$? $\frac{1}{3}$ of $\frac{2}{3}$? $\frac{1}{3}$ of $\frac{1}{4}$? $\frac{1}{4}$ of $\frac{1}{5}$? $\frac{1}{4}$ of $\frac{2}{5}$? $\frac{1}{4}$ of $\frac{3}{5}$?

155. What is $\frac{1}{3}$ of 3? $\frac{1}{3}$ of 4? $\frac{1}{3}$ of 6? $\frac{1}{3}$ of 5? $\frac{1}{2}$ of 7? $\frac{1}{4}$ of 7? $\frac{1}{5}$ of 7? $\frac{1}{4}$ of 9? $\frac{2}{5}$ of 10? $\frac{2}{3}$ of $\frac{2}{5}$?

92. WRITTEN EXERCISES.

156. Multiply $\frac{5}{7}$ by $\frac{2}{3}$.

$\frac{5}{7} \times 2 = \frac{10}{7}$

$\frac{10}{7} \div 3 = \frac{10}{21}$, Ans.

Hence,

$\frac{5}{7} \times \frac{2}{3} = \frac{10}{21}$, Ans.

By Art. 72 b, $\frac{5}{7} \times 2 = \frac{10}{7}$; but the multiplier is not 2, but $\frac{2}{3}$, or $2 \div 3$, that is, 2 is 3 times the given multiplier; therefore the product $\frac{10}{7}$ is 3 times the product sought, and must be divided by 3 to obtain the correct result. By Art. 72 b, $\frac{10}{7} \div 3 = \frac{10}{21}$, Ans.

Hence,

To multiply a fraction by a fraction,

Rule.

Multiply the numerators together for a new numerator, and the denominators for a new denominator.

NOTE 1. As a mixed number can be reduced to an improper fraction (Art. 80), and an integer expressed as a fraction by writing under it 1 as its denominator, this rule covers all possible cases in Multiplication of Fractions.

157. Multiply $\frac{3}{6}$ by $\frac{4}{7}$; $\frac{2}{3}$ by $\frac{5}{7}$; $\frac{1}{5}$ by $\frac{2}{3}$.
158. Multiply $\frac{2}{9}$ by $\frac{7}{11}$; $\frac{4}{9}$ by $\frac{2}{5}$; $\frac{6}{7}$ by $\frac{2}{9}$.
159. Multiply $\frac{8}{11}$ by $\frac{5}{9}$; $\frac{3}{11}$ by $\frac{2}{9}$; $\frac{7}{10}$ by $\frac{3}{4}$.

160. Multiply $\frac{10}{21}$ by $\frac{3}{5}$.

$$\frac{\overset{2}{\cancel{10}}}{\underset{7}{\cancel{21}}} \times \frac{\cancel{3}}{\cancel{5}} = \frac{2}{7}, \text{ Ans.}$$

Before multiplying we strike out of both numerator and denominator the factors 3 and 5, and according to Art. 72 c, the value of the fraction will not be changed. This striking out of equal factors is called *cancellation*.

NOTE 2. *Always cancel, if possible.*

161. Multiply $\frac{12}{25}$ by $\frac{5}{8}$; $\frac{8}{25}$ by $\frac{5}{16}$; $\frac{7}{9}$ by $\frac{3}{14}$.
162. Multiply $\frac{15}{22}$ by $\frac{11}{30}$; $\frac{9}{22}$ by $\frac{11}{15}$; $\frac{8}{21}$ by $\frac{7}{16}$.
163. Multiply $\frac{12}{27}$ by $\frac{9}{26}$; $\frac{4}{39}$ by $\frac{13}{24}$; $\frac{7}{27}$ by $\frac{9}{28}$.
164. Multiply $\frac{9}{25}$ by $\frac{15}{16}$; $\frac{8}{21}$ by $\frac{7}{24}$; $\frac{9}{13}$ by $\frac{39}{9}$.
165. Multiply $\frac{12}{35}$ by $\frac{7}{9}$; $\frac{17}{19}$ by $\frac{38}{51}$; $\frac{14}{15}$ by $\frac{20}{21}$.
166. Multiply $\frac{44}{49}$ by $\frac{28}{33}$; $\frac{51}{52}$ by $\frac{13}{17}$; $\frac{55}{64}$ by $\frac{16}{33}$.
167. Multiply $\frac{17}{18}$ by $\frac{9}{17}$; $\frac{25}{27}$ by $\frac{26}{65}$; $\frac{38}{39}$ by $\frac{26}{57}$.
168. Multiply $\frac{44}{75}$ by $\frac{25}{88}$; $\frac{52}{53}$ by $\frac{21}{65}$; $\frac{14}{81}$ by $\frac{162}{185}$.

169. Multiply $6\frac{3}{5}$ by $8\frac{1}{3}$.

$$6\tfrac{3}{5} \times 8\tfrac{1}{3} = \frac{\overset{11}{\cancel{33}}}{\cancel{5}} \times \frac{\overset{5}{\cancel{25}}}{\cancel{3}} = 55, \text{ Ans.}$$

170. Multiply $7\frac{1}{4}$ by $11\frac{2}{7}$; by $8\frac{1}{5}$; by $6\frac{1}{3}$; by $10\frac{1}{2}$.
171. Multiply $9\frac{1}{2}$ by $5\frac{1}{6}$; by $7\frac{2}{3}$; by $8\frac{1}{4}$; by $9\frac{1}{7}$.
172. Multiply $12\frac{2}{5}$ by $8\frac{1}{4}$; by $5\frac{2}{3}$; by $7\frac{1}{5}$; by $10\frac{2}{3}$.
173. Multiply $25\frac{1}{3}$ by $11\frac{1}{2}$; by $12\frac{1}{2}$; by $13\frac{1}{4}$; by $9\frac{7}{8}$.

174. Multiply $32\frac{2}{3}$ by 5.

$$\begin{array}{r} 32\frac{2}{3} \\ 5 \\ \hline \text{Ans. } 163\frac{1}{3} \end{array}$$

Five times $\frac{2}{3} = \frac{10}{3} = 3\frac{1}{3}$; writing the $\frac{1}{3}$ in the product, we add the 3 units to 5 times the 2 units of the multiplicand; and so on, as in multiplication of simple numbers.

NOTE 3. If one of the factors is integral and the other a mixed number, it is shorter to multiply the fraction and the integral part of the mixed number separately, as in Ex. 174.

175. Multiply $57\frac{1}{2}$ by 9; by 7; by 8; by 5; by 6.
176. Multiply $75\frac{2}{3}$ by 5; by 4; by 6; by 7; by 9.
177. Multiply $64\frac{2}{3}$ by 8; by 3; by 5; by 6; by 11.
178. Multiply $83\frac{1}{4}$ by 7; by 4; by 6; by 8; by 9.

179. Multiply 87 by $6\frac{1}{4}$.

$$\begin{array}{r} 87 \\ 6\frac{1}{4} \\ \hline 522 \\ 21\frac{3}{4} \\ \hline \text{Ans. } 543\frac{3}{4} \end{array}$$

Multiply 87 first by 6; then take $\frac{1}{4}$ of 87 ($= 21\frac{3}{4}$), and add these partial products together.

180. Multiply 125 by $7\frac{1}{2}$; by $5\frac{1}{5}$; by $4\frac{1}{4}$; by $8\frac{1}{3}$.
181. Multiply 217 by $5\frac{2}{3}$; by $4\frac{1}{7}$; by $6\frac{1}{2}$; by $9\frac{3}{7}$.
182. Multiply 185 by $16\frac{1}{5}$; by $12\frac{3}{5}$; by $25\frac{1}{3}$; by $37\frac{1}{4}$.
183. Multiply $17\frac{1}{3}$ by 16; by 12; by 15; by 27; by 51.

NOTE 4. The numerical product is the same whichever factor is considered the multiplier. $2 \times 3 = 3 \times 2$.

184. Multiply 84 by $83\frac{1}{3}$; by $88\frac{1}{4}$; by $85\frac{1}{2}$.
185. Multiply $84\frac{1}{3}$ by 83; by 81; by 85.
186. Multiply $84\frac{1}{3}$ by $83\frac{1}{3}$; by $82\frac{2}{3}$; by $85\frac{1}{5}$.
187. Multiply $\frac{9}{8}$ by 8. Ans. 9.

NOTE 5. As in EX. 187, if we multiply a fraction by its denominator, the product is its numerator.

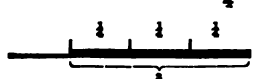
188. Multiply $\frac{5}{13}$ by 13; by 26; by 52; by 117.
189. At $12\frac{1}{2}$ cents a pound, what will 25 pounds of maple sugar cost?
190. If a yard of cloth is worth $\$2\frac{1}{4}$, what will $4\frac{1}{2}$ yards cost?

DIVISION OF FRACTIONS.

93. ORAL EXERCISES.

191. How can $\$\frac{3}{4}$ be divided equally among 3 boys?

$$\frac{3}{4} \div 3 = ?$$

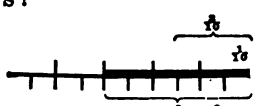


$$\frac{3}{4} \div 3 = \frac{\cancel{3}}{4} \times \frac{1}{\cancel{3}} = \frac{1}{4}.$$

If $\$\frac{3}{4}$ is divided equally among 3 boys, each boy must have 1 third of $\$\frac{3}{4}$; $\frac{1}{3}$ of $\$\frac{3}{4} = \$\frac{1}{4}$, Ans.

Dividing by 3 is equivalent to multiplying by what?

192. How can $\$\frac{3}{5}$ be divided equally between 2 boys?



$$\frac{3}{5} \div 2 = \frac{3}{5} \times \frac{1}{2} = \frac{3}{10}.$$

If $\$\frac{3}{5}$ is divided equally between 2 boys, each boy must have 1 half of $\$\frac{3}{5}$; $\frac{3}{5} = \frac{6}{10}$; therefore $\frac{1}{2}$ of $\$\frac{3}{5}$ $= \frac{1}{2}$ of $\$\frac{6}{10} = \$\frac{3}{10}$, Ans.

Dividing by 2 is equivalent to multiplying by what?
How can a fraction be divided by an integer?

193. Divide $\frac{3}{5}$ by 2; $\frac{4}{5}$ by 2; $\frac{5}{7}$ by 5; $\frac{3}{8}$ by 4; $\frac{7}{8}$ by 7.

194. Divide $\frac{3}{4}$ by 2; $\frac{2}{5}$ by 3; $\frac{5}{6}$ by 3; $\frac{3}{7}$ by 2; $\frac{3}{8}$ by 4.

195. Divide $\frac{2}{5}$ by 4; $\frac{3}{5}$ by 6; $\frac{4}{5}$ by 6; $\frac{5}{6}$ by 10; $\frac{3}{8}$ by 9.

196. How long will it take to spend $2, if you spend $\frac{1}{4}$ of a dollar a week?

197. How many quarters of a dollar are there in $2? How many times is $\frac{1}{4}$ contained in 2?

$$2 \div \tfrac{1}{4} = ?$$

198. Divide 2 by $\frac{1}{5}$; 3 by $\frac{1}{5}$; 4 by $\frac{1}{5}$; 5 by $\frac{1}{5}$; 6 by $\frac{1}{5}$.

199. Divide 2 by $\frac{2}{5}$; 3 by $\frac{2}{5}$; 4 by $\frac{2}{5}$; 5 by $\frac{2}{5}$; 6 by $\frac{2}{5}$.

200. Five are how many times $\frac{1}{3}$; $\frac{2}{3}$; $\frac{1}{4}$; $\frac{1}{2}$; $\frac{3}{4}$.

201. Six are how many times $\frac{1}{3}$; $\frac{2}{3}$; $\frac{1}{4}$; $\frac{1}{2}$; $\frac{3}{4}$.

How can an integer be divided by a fraction?

202. Divide 7 by $\frac{1}{3}$; by $\frac{2}{3}$; by $\frac{1}{2}$; by $\frac{1}{4}$; by $\frac{3}{4}$.

203. Divide 5 by $\frac{1}{3}$; $\frac{1}{3}$ by 5; 8 by $\frac{1}{2}$; $\frac{1}{2}$ by 8.

In division, does it make any difference with the quotient if the divisor and dividend are interchanged?

204. If Albert spends $\frac{2}{5}$ of a dollar a week, how many weeks will it take him to spend $\frac{6}{5}$ of a dollar?

205. How many times is $\frac{2}{5}$ contained in $\frac{6}{5}$?

$$\tfrac{6}{5} \div \tfrac{2}{5} = ?$$

NOTE. If the denominator of the divisor and of the dividend are alike, they may both be disregarded, for evidently 2 fifths is contained in 6 fifths as many times as 2 cents is contained in 6 cents, or 2 in 6.

206. Divide $\frac{4}{7}$ by $\frac{2}{7}$; $\frac{6}{11}$ by $\frac{3}{11}$; $\frac{10}{11}$ by $\frac{5}{11}$; $\frac{12}{13}$ by $\frac{6}{13}$; $\frac{14}{15}$ by $\frac{7}{15}$.

207. How many times is $\frac{1}{9}$ contained in $\frac{1}{3}$?

$$\frac{1}{3} \div \frac{1}{9} = \frac{3}{9} \div \frac{1}{9} = ?$$

208. Divide $\frac{1}{4}$ by $\frac{1}{8}$; $\frac{1}{2}$ by $\frac{1}{4}$; $\frac{2}{3}$ by $\frac{1}{6}$; $\frac{3}{5}$ by $\frac{1}{10}$; $\frac{1}{2}$ by $\frac{1}{8}$.

94. WRITTEN EXERCISES.

209. How many times is $\frac{1}{3}$ contained in $\frac{1}{2}$?

$$\frac{1}{2} \div \frac{1}{3} = \frac{3}{6} \div \frac{2}{6} = \frac{3}{2} = 1\frac{1}{2}, \text{ Ans.}$$

210. Divide $\frac{1}{2}$ by $\frac{1}{5}$; $\frac{1}{3}$ by $\frac{1}{5}$; $\frac{2}{3}$ by $\frac{2}{5}$; $\frac{3}{4}$ by $\frac{2}{5}$; $\frac{1}{4}$ by $\frac{1}{5}$.

211. How many times is $\frac{1}{3}$ contained in $\frac{1}{5}$?

$$\frac{1}{5} \div \frac{1}{3} = \frac{3}{15} \div \frac{5}{15} = 3 \div 5 = \frac{3}{5}, \text{ Ans.}$$

212. Divide $\frac{1}{2}$ by $\frac{2}{3}$; $\frac{2}{5}$ by $\frac{5}{6}$; $\frac{1}{6}$ by $\frac{1}{5}$; $\frac{1}{4}$ by $\frac{4}{5}$; $\frac{2}{3}$ by $\frac{5}{7}$.

How then can one fraction be divided by another?

213. Divide $2\frac{1}{2}$ by $3\frac{1}{4}$.

$$2\frac{1}{2} \div 3\frac{1}{4} = \frac{5}{2} \div \frac{13}{4} = \frac{10}{4} \div \frac{13}{4} = ?$$

214. Divide $\frac{12}{25}$ by $\frac{4}{5}$.

$\frac{12}{25} \div \frac{4}{5} = \frac{3}{5}$, Ans.

As in multiplication of fractions we multiply the numerators together for the numerator of the product, and the denominators for the denominator, and division is the reverse of multiplication, therefore, if we divide the numerator of the dividend by the numerator of the divisor, and the denominator of the dividend by the denominator of the divisor, we shall have the numerator and denominator respectively of the quotient.

The practical difficulty with this method is that the terms of the dividend are rarely both divisible by the respective terms of the divisor.

215. Divide $\frac{3}{7}$ by $\frac{2}{5}$.

$\frac{3}{7} \div 2 = \frac{3}{14}$

$\frac{3}{14} \times 5 = \frac{15}{14}$, Ans.

Hence,

$\frac{3}{7} \div \frac{2}{5} = \frac{3}{7} \times \frac{5}{2} = \frac{15}{14}$, Ans.

By Art. 72 b, $\frac{3}{7} \div 2 = \frac{3}{14}$; but the divisor is not 2 but $\frac{2}{5}$, or $2 \div 5$, that is, 2 is 5 times the given divisor; therefore the quotient $\frac{3}{14}$ is 1 fifth the quotient sought, and must be multiplied by 5 to obtain the correct result. By Art. 72 b, $\frac{3}{14} \times 5 = \frac{15}{14}$, Ans.

It will be seen that we multiply the denominator of the dividend by the numerator of the divisor for the denominator of the quotient, and the numerator of the dividend by the denominator of the divisor for the numerator of the quotient. Hence,

To divide a fraction by a fraction,

Rule.

Invert the divisor and proceed as in multiplication of fractions.

NOTE 1. As an integer can be expressed as a fraction by writing 1 under it as its denominator, and a mixed number can be reduced to an improper fraction, this rule covers all possible cases in Division of Fractions.

216. Divide $\frac{5}{6}$ by $\frac{2}{7}$; $\frac{2}{7}$ by $\frac{5}{6}$; $\frac{4}{9}$ by $\frac{5}{7}$; $\frac{5}{7}$ by $\frac{4}{9}$.

217. Divide $\frac{3}{7}$ by $\frac{4}{5}$; $\frac{4}{5}$ by $\frac{3}{7}$; $\frac{5}{8}$ by $\frac{3}{7}$; $\frac{3}{7}$ by $\frac{5}{8}$.

218. Divide $\frac{5}{8}$ by $\frac{9}{11}$; $\frac{9}{11}$ by $\frac{5}{8}$; $\frac{5}{8}$ by $\frac{11}{9}$; $\frac{11}{9}$ by $\frac{5}{8}$.

219. Divide $\frac{9}{10}$ by $\frac{12}{25}$.

$$\frac{9}{10} \div \frac{12}{25} = \frac{\overset{3}{\cancel{9}}}{\underset{2}{\cancel{10}}} \times \frac{\overset{5}{\cancel{25}}}{\underset{4}{\cancel{12}}} = \frac{15}{8} = 1\tfrac{7}{8}, \text{ Ans.}$$

NOTE 2. *Always cancel, if possible.*

220. Divide $\frac{8}{9}$ by $\frac{4}{15}$; $\frac{4}{15}$ by $\frac{8}{9}$; $\frac{8}{9}$ by $\frac{2}{15}$.
221. Divide $\frac{7}{13}$ by $\frac{21}{52}$; $\frac{21}{52}$ by $\frac{7}{13}$; $\frac{7}{8}$ by $\frac{21}{40}$.
222. Divide $\frac{13}{25}$ by $\frac{2}{4}$; $\frac{2}{4}$ by $\frac{12}{25}$; $\frac{8}{9}$ by $\frac{16}{135}$.
223. Divide $\frac{8}{11}$ by $\frac{20}{33}$; $\frac{20}{33}$ by $\frac{8}{11}$; $\frac{152}{161}$ by $\frac{51}{322}$.
224. Divide $\frac{6}{13}$ by $\frac{4}{39}$; $\frac{4}{39}$ by $\frac{6}{13}$; $\frac{8}{37}$ by $\frac{24}{111}$.
225. Divide $\frac{7}{8}$ by $\frac{8}{16}$; $\frac{8}{16}$ by $\frac{7}{8}$; $\frac{17}{54}$ by $\frac{51}{112}$.

226. Divide $177\frac{1}{3}$ by 4.

$$4)\ 177\tfrac{1}{3}$$
$$\text{Ans. } 44\tfrac{1}{3}$$

Dividing as in short division, we have 1 unit remainder; this 1 unit is equal to $\frac{3}{3}$, which added to the $\frac{1}{3}$ gives $\frac{4}{3}$; $\frac{4}{3} \div 4 = \frac{1}{3}$; this $\frac{1}{3}$ added to the quotient 44 gives $44\frac{1}{3}$, Ans.

227. Divide $461\frac{3}{4}$ by 6; by 5; by 7; by 9.
228. Divide $578\frac{1}{5}$ by 7; by 4; by 6; by 8.
229. Divide $237\frac{2}{3}$ by 5; by 3; by 7; by 9.
230. Divide $348\frac{1}{6}$ by 8; by 5; by 6; by 7.
231. If for 5 days work I pay $\$8\frac{3}{4}$, how much do I pay for each day?
232. If $8\frac{1}{2}$ pounds of coffee cost $\$2\frac{5}{6}$, what does it cost a pound?
233. If 24 pounds of ham cost $\$3$, what will 19 pounds cost?
234. If 75 pounds of soap cost $\$4\frac{1}{16}$, what is it a pound?
235. If 25 barrels of beans cost $\$246\frac{7}{8}$, how much is that a barrel?
236. If $\$48\frac{3}{4}$ will buy $19\frac{1}{2}$ yards of broadcloth, how many yards can be bought for $\$38\frac{3}{4}$?
237. How many barrels of apples at $\$1\frac{3}{4}$ a barrel must be given for 28 yards of cotton at $\$\frac{1}{8}$ a yard?
238. If a turkey weighing $9\frac{3}{4}$ pounds is worth $\$1\frac{5}{8}$, how much ought one that cost $\$1\frac{3}{4}$ to weigh?

95. ORAL EXERCISES.

1. A boy bought a pair of skates for $2\frac{1}{2}$ dollars, a snow-shovel for $\frac{1}{2}$ of a dollar, and a sled for $1\frac{3}{4}$ dollars. How much did they all cost him?

2. Mabel bought a work-basket for $\frac{7}{8}$ of a dollar, a pair of gloves for $1\frac{1}{3}$ dollars, and a book for $1\frac{3}{5}$ dollars. How much did she pay for all?

3. Henry picked $\frac{1}{2}$ of a peck of nuts, Howard $\frac{1}{3}$ of a peck, and Edward $\frac{2}{3}$ of a peck. How many pecks of nuts did they all pick?

4. A fruit-dealer bought 5 dozen oranges at $\frac{1}{4}$ of a dollar a dozen, and sold them at $\frac{2}{5}$ of a dollar a dozen. How much was his profit on the lot?

5. A newsboy paid $1\frac{1}{4}$ dollars a hundred for papers, and sold them for 2 dollars a hundred. How much did he make on a hundred?

6. Frank paid $5\frac{1}{2}$ dollars for a double-runner sled, $1\frac{1}{4}$ dollars for painting it, and $\frac{7}{8}$ of a dollar for a bell for it. How much was the entire cost?

7. If I use $8\frac{1}{2}$ tons of furnace-coal and $3\frac{1}{4}$ tons of stove-coal in a year, how much coal do I use in all, and how much more furnace-coal than stove-coal?

8. Abbott bought a hat for $2\frac{1}{4}$ dollars, a pair of gloves for $\frac{1}{2}$ of a dollar, and a pair of boots for $2\frac{3}{4}$ dollars. How much did they cost?

9. Add $8\frac{1}{4}$ and $7\frac{1}{2}$; $5\frac{2}{5}$ and $7\frac{1}{5}$.

10. When grapes are 12 cents a pound, what will $3\frac{1}{2}$ pounds cost?

11. From $\frac{5}{6}$ take $\frac{5}{12}$. Take $\frac{3}{10}$ from $\frac{2}{5}$.

12. A boy having a quart of peanuts gave $\frac{1}{2}$ of them to his playmates and $\frac{1}{4}$ of them to his mother, and kept the rest. How many did he give away?

13. How long will $4 last a boy if he spends $\frac{1}{2}$ of a dollar a week?

14. How much is $\frac{5}{8}$ less $\frac{1}{4}$? $\frac{1}{3}$ less $\frac{1}{4}$? $\frac{1}{2}$ less $\frac{1}{3}$?

15. What part of a ton of coal is 3 times $\frac{1}{4}$ of it?

16. If $\frac{3}{4}$ of a pound of candy costs 24 cents, what is that a pound?

17. A grocer sold $\frac{1}{3}$ of a box of raisins to one man, $\frac{3}{4}$ to another, and kept the rest. What part of the box of raisins did he keep?

18. A man owning $\frac{5}{6}$ of a wood-lot, sold $\frac{1}{3}$ of his share. What part of the whole did he sell?

19. If one quart of peaches is worth 10 cents, what are $9\frac{1}{2}$ quarts worth?

20. If $\frac{1}{3}$ of a barrel of flour costs $1, what will a barrel cost?

21. A farmer cut $\frac{1}{4}$ of the grass on his meadow on Monday, $\frac{1}{3}$ on Tuesday, and $\frac{1}{3}$ on Wednesday. What part did he cut in the three days?

22. James having $\frac{3}{4}$ of a dollar given him, spent $\frac{1}{5}$ of a dollar. How much remained?

23. At $\frac{3}{4}$ of a dollar a bushel, what are 2 bushels of potatoes worth? 3 bushels? 4 bushels? 5 bushels? 6 bushels?

24. If I pay 72 cents for 8 yards of cotton cloth, what is the cost a yard?

25. What part of any thing is $\frac{1}{4} + \frac{1}{8} + \frac{1}{16}$?

26. In a flower-garden $\frac{2}{3}$ of the flowers are red roses, $\frac{1}{6}$ are white roses, and the remainder are tulips. What part of the whole are tulips?

27. If one third of a melon is worth 12 cents, what is the whole melon worth

28. 33 feet is $\frac{3}{8}$ of the length of a barn. How long is the barn?

29. At 12 cents a pound, what are $7\frac{1}{2}$ pounds of cheese worth?

30. A man making a journey travelled $\frac{1}{6}$ of it the first day, $\frac{1}{3}$ the second day, and $\frac{1}{4}$ the third day. What part of the journey was uncompleted?

31. A grain-dealer having $\frac{5}{6}$ of a car-load of grain, sold $\frac{1}{3}$, then $\frac{1}{4}$, and then $\frac{1}{6}$ of it. What part remained unsold?

32. A man received \$45, which was $\frac{5}{9}$ of the amount due. What sum was still due?

33. Mr. Douglass dug $\frac{7}{9}$ of a field of potatoes, and Mr. James the rest. The whole field yielded 63 bushels. How many bushels did Mr. James dig?

34. A boy paid $\frac{1}{4}$ of a dollar for an arithmetic, $\frac{1}{3}$ of a dollar for a geography, and $\frac{1}{6}$ of a dollar for a grammar. What part of a dollar did he pay for all?

35. A merchant owning $\frac{3}{5}$ of a ship sold $\frac{1}{3}$ of his share. What part of the whole did he sell?

36. Of 72 cords of wood furnished four school-houses, $\frac{5}{9}$ was burned during the year. How many cords remained?

37. If $\frac{1}{3}$ of a fortune is spent the first year, and $\frac{1}{2}$ the second, and $\frac{1}{6}$ the third, what part remains?

38. At \$2$\frac{1}{2}$ a barrel, what will 7 barrels of apples cost? 9 barrels? 10 barrels? 12 barrels?

39. A pump that was placed in a well was in three pieces; the first piece contained 10$\frac{1}{4}$ feet, the second 9$\frac{1}{2}$ feet, and the third 12$\frac{1}{4}$ feet. How long was the pump?

40. If a yard of silk costs \$2.50, what is $\frac{1}{4}$ of a yard worth?

41. Of 108 barrels of apples, $\frac{7}{12}$ were Baldwins, $\frac{1}{4}$ russets, and the remainder were Hubbardstons. How many barrels were there of each kind?

42. If 5$\frac{1}{2}$ cords of wood cost \$27$\frac{1}{2}$, how much is this a cord?

43. If an acre of land will produce 36 bushels of corn, how much land will it take to raise 9 bushels? 18 bushels? 27 bushels? 20 bushels?

44. If a ton of hay is worth $15, what is $\frac{3}{5}$ of a ton worth? $\frac{1}{2}$? $\frac{1}{4}$? $\frac{3}{10}$? $\frac{3}{4}$?

45. If I own $\frac{3}{5}$ of a farm, and sell $\frac{2}{3}$ of my share, what part of the farm do I sell? What part shall I have left?

46. At $6\frac{1}{2}$ a ton, what will $\frac{1}{4}$ of a ton of coal cost? $\frac{1}{2}$? $\frac{3}{4}$? $\frac{2}{3}$?

47. If I pay 15 cents for $2\frac{1}{2}$ yards of print, what is that a yard?

48. Find the cost of $6\frac{1}{2}$ yards of ribbon at $6\frac{1}{2}$ cents a yard.

49. If a man earns $7\frac{1}{2}$ in $3\frac{1}{2}$ days, how much does he earn a day?

50. Of a debt of $25, John paid $\frac{1}{10}$ a week for 7 weeks. How many dollars did he then owe?

51. What part of $\frac{1}{2}$ is $\frac{1}{4}$? Of $\frac{3}{4}$ is $\frac{1}{2}$?

52. If a man earns $3\frac{1}{2}$ a day, how much will he earn in 5 days? In $5\frac{1}{2}$ days? In $7\frac{1}{4}$ days? In $8\frac{1}{2}$ days?

53. James' age is $\frac{5}{7}$ of John's, and James is 15 years old. How old is John?

54. A man spends $25, or $\frac{5}{6}$ of all his money. How much money did he have?

55. If having 50 cents I spend 15, what part of my money do I spend? What part have I left?

56. Four boys together pick a bushel of chestnuts, for which they receive $3. It is estimated that the eldest picked $\frac{1}{2}$ a bushel, the next younger $\frac{1}{4}$, the next $\frac{1}{8}$, and the youngest the rest. How much of the money should each receive?

57. If $4\frac{1}{2}$ yards of cloth costs $9, what will $\frac{3}{4}$ of a yard cost?

96. WRITTEN EXERCISES.

58. How many yards in four pieces of cloth measuring $17\frac{1}{2}$, $15\frac{3}{8}$, $24\frac{1}{5}$, and $49\frac{1}{4}$ yards?

59. A man bought $390\frac{1}{2}$ acres of land, and sold $75\frac{1}{8}$ acres at one time and $103\frac{1}{4}$ acres at another time. How many acres remained unsold?

60. A club paid $\$57\frac{3}{4}$ for magazines and $\$39\frac{1}{5}$ for papers. How much did it pay for both, and how much more for magazines than papers?

61. From a chest of tea weighing $59\frac{1}{4}$ pounds, $25\frac{7}{8}$ pounds were sold. How many pounds remained unsold?

62. Bought a barrel of kerosene containing $42\frac{1}{2}$ gallons, and $3\frac{3}{4}$ gallons leaked out. How much remained in the barrel?

63. I paid $\$32\frac{1}{2}$ for papering a room and $\$45\frac{1}{4}$ for carpeting it. How much did I pay for both? How much more did it cost to carpet than to paper it?

64. From a farm of $180\frac{1}{2}$ acres of land I sold $39\frac{1}{8}$ acres at one time and $68\frac{1}{4}$ acres at another time. How many acres remained unsold?

65. A grocer paid $\$690\frac{1}{4}$ for flour, $\$97\frac{1}{2}$ for sugar, $\$42\frac{1}{5}$ for tea, and $\$79\frac{1}{4}$ for coffee. How much did they all cost, and how much more did the flour cost than all the other articles combined?

66. A farmer received $\$114\frac{1}{2}$ for sale of apples, and $\$67\frac{1}{4}$ for potatoes. How much did he receive for both, and how much more for the apples than potatoes?

67. I paid $\$175\frac{1}{2}$ for a horse and $\$148\frac{3}{4}$ for a carriage. How much did both cost, and how much more did the horse cost than the carriage?

68. Reduce to their lowest terms, $\frac{15}{18}$, $\frac{14}{42}$, $\frac{24}{72}$, $\frac{45}{55}$, $\frac{54}{60}$, $\frac{24}{36}$, $\frac{40}{75}$.

69. A man bought three loads of hay, the first weighing $\frac{7}{8}$ of a ton, the second $\frac{7}{12}$ of a ton, and the third $\frac{3}{4}$ of a ton. How many tons did he buy?

70. From a cask containing $32\frac{1}{4}$ gallons of vinegar $17\frac{1}{2}$ gallons were drawn out. How much remained?

71. If a pound of nuts costs $9\frac{1}{2}$ cents, what will 75 pounds cost?

72. From the sum of $8\frac{1}{2}$ and $8\frac{5}{6}$ subtract $7\frac{1}{2}$.

73. What will $7\frac{1}{2}$ cords of wood cost, at $\$6\frac{3}{4}$ a cord?

74. If a man's personal expenses are $\$248$ for $\frac{5}{6}$ of a year, what, at the same rate, are his expenses for a year?

75. If a family of 6 persons spend $\$685\frac{1}{2}$ in a year, what is the average for each person?

76. Add together, $\$5\frac{2}{3}$, $\$14\frac{4}{9}$, and $\$17\frac{5}{12}$.

77. Reduce to improper fractions, $27\frac{1}{3}$; $38\frac{2}{7}$; $46\frac{3}{8}$; $72\frac{4}{9}$; $96\frac{10}{11}$; $108\frac{5}{13}$.

78. George, having $\$1$, spent $\frac{1}{5}$ for candy, $\frac{3}{10}$ for oranges, and $\frac{1}{6}$ for nuts. How much did he spend in all?

79. Mr. Clarke spent $\frac{1}{4}$ of his salary for board, $\frac{1}{6}$ in travelling, and $\frac{1}{3}$ for other purposes. What part of his salary did he spend?

80. Reduce to whole or mixed numbers, $\frac{455}{6}$; $\frac{674}{9}$; $\frac{487}{10}$; $\frac{968}{16}$; $\frac{1023}{15}$; $\frac{2017}{18}$.

81. A man bought a wagon for $\$125$, and, after paying $\frac{2}{5}$ of its cost for repairs, sold it for $\$185$. How much did he make?

82. A laborer did $\frac{1}{4}$ of a piece of work one day, $\frac{1}{3}$ the second day, and $\frac{2}{5}$ the third day. What part remained unfinished?

83. Mr. Everett bought 750 pounds of white lead at $6\frac{1}{2}$ cents a pound, and $37\frac{1}{2}$ gallons of oil at 60 cents a gallon. What did the whole cost?

84. Mr. Hill has $\frac{1}{8}$ of an acre of strawberries, $\frac{1}{4}$ of an acre of blackberries, $\frac{1}{6}$ of an acre of raspberries, and $\frac{1}{2}$ of an acre of currants. How many acres has he in these small fruits?

85. A boy having $5 made a journey from Somerville, Mass., to Portland, Me. He paid $2\frac{1}{2}$ for his ticket, $\frac{1}{2}$ of a dollar for lunch at Portsmouth, and $\frac{3}{4}$ of a dollar for a book. How much of the $5 had he left?

86. Mr. Bigelow sold $3\frac{1}{2}$ barrels of cranberries at $9\frac{1}{2}$ a barrel. How much did he get for them?

87. What costs $3\frac{4}{5}$ yards of cloth at $2\frac{3}{4}$ a yard?

88. Mr. Smith's grocery bill one month was $18\frac{3}{4}$, and another month it was $15\frac{4}{5}$. How much more was his bill for one month than for the other?

89. If I pay $2\frac{1}{6}$ for sugar, $4\frac{1}{3}$ for butter, and $1\frac{1}{2}$ for molasses, how much do I pay for all?

90. What costs $2\frac{2}{3}$ cords of wood at $6\frac{1}{4}$ a cord?

91. If a man picks $5\frac{1}{2}$ barrels of apples in a day, how many can he pick in $17\frac{1}{4}$ days?

92. When $13\frac{1}{4}$ pounds of beef cost $2.12, what is that a pound?

93. A man travelled 22 miles in $7\frac{2}{3}$ hours. How far did he travel an hour?

94. The sum of two numbers is $315\frac{1}{8}$, the less number is $129\frac{3}{4}$. Find the greater number.

95. If the small wheel of a bicycle turns 984 times in going a mile, how many times will it turn in going $\frac{2}{3}$ of a mile?

96. There are $5\frac{1}{2}$ yards in a rod. How many yards are there in 320 rods? There are $16\frac{1}{2}$ feet in a rod. How many feet in 320 rods?

97. If a hotel uses $\frac{3}{8}$ of a barrel of flour in a day, in how many days will it use $7\frac{1}{4}$ barrels? $25\frac{1}{10}$ barrels?

98. If a man earns $\$1\frac{3}{4}$ a day, how much does he earn in a month of 26 working days?

99. Mr. Small paid $\$71\frac{1}{4}$ for $7\frac{1}{2}$ weeks' board. What did he pay a week?

100. Mrs. Clarke paid $\$12\frac{3}{4}$ for 15 Christmas cards. How much did each cost?

101. A teacher paid $\$24\frac{3}{10}$ for 27 readers. How much did she pay for each?

102. Mr. Ward paid $\$22\frac{4}{10}$ for $3\frac{1}{2}$ tons of coal. What did he pay a ton?

103. Willie bought a box of candy containing $4\frac{3}{4}$ pounds for $\$1.33$. What did the candy cost him a pound?

104. Reduce to whole or mixed numbers, $\frac{275}{4}$; $\frac{285}{5}$; $\frac{487}{7}$; $\frac{264}{9}$; $\frac{1001}{8}$.

105. Reduce to improper fractions, $87\frac{3}{8}$; $56\frac{3}{10}$; $45\frac{9}{16}$; $73\frac{1}{12}$; $63\frac{8}{15}$; $394\frac{5}{18}$; $567\frac{13}{17}$; $596\frac{11}{20}$; $581\frac{23}{27}$.

106. If one pound of grapes costs $16\frac{2}{3}$ cents, what will 16 pounds cost? 18 pounds? 28 pounds? 34 pounds?

107. A flour dealer paid $\$69$ for flour at $\$5\frac{3}{4}$ a barrel. How many barrels did he buy?

108. Wallace is saving money to buy a bicycle, which costs $\$87\frac{1}{2}$. The first month he saved $\$8\frac{3}{4}$; the next three months, $\$25\frac{1}{4}$; the next two months he saved $\$18$. How much more must he save?

109. If $8\frac{1}{2}$ pounds of beef can be bought for $\$1.87$, how many pounds, at the same rate, can be bought for $\$2.75$?

110. A certain sum of money was divided so that A had $\frac{1}{5}$, B $\frac{1}{3}$, C $\frac{3}{10}$, and D $\$25$. What was the whole sum divided?

111. How many pounds of beans at $9\frac{1}{2}$ cents a pound, can be bought for 7 dozen of eggs at 21 cents a dozen?

DECIMALS.

97. A **Decimal Fraction,** or a **Decimal,** is a fraction whose denominator is 10, 100, 1 000, or 1 with one or more ciphers annexed. As its denominator is always 1 with as many ciphers annexed as there are figures in the decimal, the numerator only may be written, with the decimal point.

98. In Arts. 18–20 decimals have been written only to three places, but they can be carried as far as we choose. Thus,

0.0214 is 214 ten-thousandths.
0.50413 is 50413 hundred-thousandths.
0.000375 is 375 millionths.
45.0104 is 45, and 104 ten-thousandths.
525.000525 is 525, and 525 millionths.

(See Note in Art. 18.)

99. Read the following numbers:

1.	0.653	9.	4.81765
2.	2.87	10.	13.00004
3.	13.07	11.	8.17621
4.	71.006	12.	0.010101
5.	18.178	13.	0.10101
6.	99.8764	14.	2.346002
7.	0.3495	15.	14.070642
8.	0.0075	16.	25.252525

100. Write in figures the following numbers:

17. Seven ten-thousandths.
18. Eighteen ten-thousandths.

19. Nine hundred-thousandths.
20. Five millionths.
21. Two hundred four millionths.
22. Two hundred, and four millionths.
23. Sixteen, and forty-five ten-thousandths.
24. Eighty, and four hundred seventeen millionths.
25. Nine hundred, and nine hundred thousandths.
26. Nine hundred nine hundred-thousandths.

101. The following table is a continuation to the right of the table in Art. 18.

NUMERATION TABLE.

Thousands,	Hundreds,	Tens,	Units.		Tenths,	Hundredths,	Thousandths,	Ten-Thousandths,	Hundred-Thousandths,	Millionths,
3	4	5	6	.	7	8	2	9	5	4

The number in this table, expressed in words, is three thousand four hundred fifty-six, and seven hundred eighty-two thousand nine hundred fifty-four millionths.

102. Though decimals can be added, subtracted, multiplied, and divided as integral quantities, yet, as parts of a unit, they are fractions. Thus, 0.5 is $\frac{5}{10}$; 0.14 is $\frac{14}{100}$; 0.125 is $\frac{125}{1000}$; etc.

Every principle and operation in Fractions is equally applicable to Decimals.

For Addition and Subtraction of Decimals, see pages 13–38.

MULTIPLICATION OF DECIMALS.

103. WRITTEN EXERCISES.

27. Multiply 371 by 0.4.

371
0.4
Ans. 148.4

As $0.4 = \frac{4}{10}$, $371 \times 0.4 = 371 \times \frac{4}{10} = \frac{1484}{10}$, or 148.4, Ans.

28. Multiply 0.453 by 0.3.

0.453
0.3
Ans. 0.1359

As $0.453 = \frac{453}{1000}$, and $0.3 = \frac{3}{10}$, $0.453 \times 0.3 = \frac{453}{1000} \times \frac{3}{10} = \frac{1359}{10000}$, or 0.1359, Ans.

29. Multiply 0.0321 by 0.02.

0.0321
0.02
Ans. 0.000642

As $0.0321 = \frac{321}{10000}$, and $0.02 = \frac{2}{100}$, $0.0321 \times 0.02 = \frac{321}{10000} \times \frac{2}{100} = \frac{642}{1000000}$, or 0.000642, Ans.

From these examples we derive the following

Rule.

Multiply as in whole numbers, and point off as many figures for decimals in the product as there are decimal places in both factors, counted together.

NOTE 1. If the number of figures in the product is less than the number of decimal places in the two factors, the deficiency must be supplied by *prefixing ciphers to the product*, as in EXS. 29 and 32.

NOTE 2. The pointing off is in reality the multiplying of the denominators of the factors, or it shows what the product of the denominators is.

	(30.)	(31.)
Multiplicand,	3.567	745.006
Multiplier,	2.4	3.02
	14268	1490012
	7134	2235018
Product,	8.5608	2249.91812

	(32.)	(33.)
Multiplicand,	0.00417	24.68
Multiplier,	2.7	0.15
	2919	12340
	834	2468
Product,	0.011259	3.702

34. Multiply 4.14 by 0.6; by 0.3; by 0.9.
35. Multiply 89.73 by 1.5; by 2.5; by 1.3.
36. Multiply 27.06 by 2.3; by 3.2; by 4.6.
37. Multiply 245.14 by 0.7; by 0.9; by 3.1.
38. Multiply 187.415 by 3.2; by 2.3; by 7.2.
39. Multiply 0.0048 by 0.12; by 1.2; by 12.2.
40. Multiply 0.0374 by 0.05; by 0.55; by 5.5.
41. Multiply 818.76 by 8.5; by 0.85; by 0.085.
42. Multiply 76.54 by 5.15; by 51.5; by 0.515.
43. Multiply 123.484 by 10.5; by 11.5; by 20.5.
44. Multiply 0.0045 by 450; by 4.5; by 540.
45. Multiply 75.4 by 1.35; by 53.1; by 3.51.
46. Multiply 88.05 by 0.024; by 2.4; by 420.
47. Multiply 37.57 by 0.0094; by 9.4; by 4.9.
48. Multiply three, and thirty-five hundredths by fourteen thousandths.
49. Multiply five hundred forty-seven, and eighty-five thousandths by fifty-six, and two tenths.

DIVISION OF DECIMALS.

104. WRITTEN EXERCISES.

50. Divide 435.5 by 0.5.

0.5) 435.5
Ans. 871

As $435.5 = \frac{4355}{10}$, and $0.5 = \frac{5}{10}$, $435.5 \div 0.5 = \frac{4355}{10} \div \frac{5}{10} = 4355 \div 5 = 871$, Ans.

51. Divide 0.156 by 0.4.

0.4) 0.156
Ans. 0.39

As $0.156 = \frac{156}{1000}$, and $0.4 = \frac{4}{10}$, $0.156 \div 0.4 = \frac{156}{1000} \div \frac{4}{10} = \frac{39}{100}$, or 0.39, Ans.

52. Divide 0.4 by 0.008.

0.008) 0.400
Ans. 50

As $0.4 = \frac{4}{10} = \frac{400}{1000}$, and $0.008 = \frac{8}{1000}$, $0.4 \div 0.008 = \frac{400}{1000} \div \frac{8}{1000} = 50$, Ans.

From these examples we derive the following

Rule.

Divide as in whole numbers, and point off as many figures for decimals in the quotient as the number of decimal places in the dividend exceeds the number in the divisor.

NOTE 1. If there are not as many decimal places in the dividend as in the divisor, make as many by annexing ciphers.

NOTE 2. If the number of figures in the quotient is less than the excess of decimal places in the dividend over those of the divisor, supply the deficiency by *prefixing ciphers to the quotient.*

NOTE 3. The pointing off is in reality the dividing of the denominator of the dividend by the denominator of the divisor, or it shows what that quotient is.

NOTE 4. The rule for pointing in the quotient is also evident from the rule in multiplication if we notice that the dividend is a product whose factors are the divisor and quotient.

53. Divide 17.15 by 0.5; by 0.7; by 0.035.
54. Divide 184.014 by 0.018; by 0.09; by 0.6.
55. Divide 75 by 0.05; by 1.5; by 0.15; by 0.5.
56. Divide 0.344 by 0.08; by 0.8; by 0.004.
57. Divide 21.15 by 0.015; by 4.5; by 0.09.
58. Divide 18.076 by 24; by 2.4; by 0.008.
59. Divide 0.001 by 100; by 1000; by 10.
60. Divide 100 by 0.001; by 0.01; by 0.1.
61. Divide 216.14 by 20; by 7.5; by 60.
62. Divide 8178.212 by 0.6; by 0.04; by 24.
63. Divide 76.148 by 8.7; by 7.8; by 4.7.
64. Divide 0.429 by 30; by 0.35; by 70.
65. Divide 7.15 by 250; by 125; by 2.5.
66. Divide 0.876 by 1.6; by 9.6; by 1.7.
67. Divide 4.563 by 0.027; by 0.18; by 84.
68. Divide 70.18 by 24.2; by 85; by 1.21.
69. Divide 185.25 by 0.075; by 7.5; by 18.1.
70. Divide 0.074 by 370; by 73; by 4.4.
71. Divide 370 by 0.074; by 4.7; by 850.
72. Divide 268.4 by 0.44; by 4.4; by 88.
73. Divide fourteen thousand five hundred six, and eight tenths by eight hundred forty.
74. Divide seven hundred eight, and three hundred twelve thousandths by two, and sixty-four hundredths.
75. Divide ninety-five, and sixteen thousandths by one hundred sixty.
76. Divide twenty-three thousand three hundred seven, and three hundredths by one, and five tenths.

105. To reduce any fraction to a decimal.

77. Reduce $\frac{3}{4}$ to a decimal.

4) 3.00
0.75, Ans.

The value of a fraction is the quotient obtained by dividing the numerator by the denominator (Art. 72, a). $\frac{3}{4} = 3 \div 4$; but as 4 is not contained in 3, we reduce the 3 to tenths; 3 = 30 tenths; 30 tenths divided by 4 gives 7 tenths, and 2 tenths remainder; 2 tenths = 20 hundredths; 20 hundredths divided by 4 gives 5 hundredths; therefore, $\frac{3}{4} = 0.75$, Ans. Hence,

Rule.

Annex one or more ciphers to the numerator and divide the result by the denominator, continuing the operation until there is no remainder, or as far as desirable. Point off as in division of decimals.

78. Reduce $\frac{7}{8}$ to a decimal.
79. Reduce $\frac{4}{5}$ to a decimal.
80. Reduce $\frac{7}{9}$ to a decimal.
81. Reduce $\frac{15}{16}$ to a decimal.
82. Reduce $\frac{12}{5}$ to a decimal.
83. Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$, $\frac{1}{6}$, $\frac{5}{6}$, $\frac{1}{7}$, $\frac{2}{7}$, to decimals.

106. A *decimal is a fraction*, and, if its denominator is written, it will *appear* as such.

84. Reduce 0.25 to its lowest terms.

$$0.25 = \frac{25}{100} = \frac{1}{4}, \text{ Ans.}$$

85. Reduce 0.85 to its lowest terms.
86. Reduce 0.375 to its lowest terms.
87. Reduce 0.125 to its lowest terms.
88. Reduce 0.425 to its lowest terms.
89. Reduce 2.5, 3.35, 2.75, 3.25, 2.0125, to their lowest terms.

90. Reduce $\frac{11}{20}$ to a decimal.
91. Reduce 0.875 to its lowest terms.
92. Multiply 80.017 by 0.7; by 0.007; by 1.7.
93. Multiply 175.06 by 5.14; by 0.18; by 0.04.
94. Divide 757.061 by 2.4; by 3.15; by 15.2.
95. Divide 315.47 by 0.44; by 2.8; by 1.7.
96. Multiply 173.14 by 4.13; by 0.12; by 0.004.
97. Multiply 421.08 by 210; by 0.021; by 0.7.
98. Multiply 176.15 by 0.08; by 80; by 1.8.
99. Divide 718.4 by 0.02; by 20; by 1.5.
100. Divide 670.08 by 4.4; by 0.16; by 0.08.
101. Divide 108.06 by 3.2; by 22; by 0.11.
102. Multiply eighty-five, and seven hundredths by two hundred twenty.
103. Multiply three hundred, and fourteen hundredths by eight, and seven tenths.
104. Multiply two hundred, and two hundredths by thirty, and three tenths.
105. Multiply six thousand, and four thousandths by three hundred.
106. Divide thirteen hundred one, and fifteen thousandths by seven hundred fifty.
107. Divide forty-five hundred by fifteen thousandths.
108. Divide seven hundred fifteen thousandths by eighty-five.
109. Divide four hundred, and twenty-five hundredths by forty-five.
110. Divide one thousand by one thousandth.
111. Divide eight hundred, and six thousandths by two tenths.
112. Divide sixteen hundred five by fifteen hundredths.
113. Divide thirty-five thousand three hundred ten, and five hundredths by twenty-five thousandths.

DECIMAL SYSTEM OF MONEY.



107. UNITED STATES MONEY.

10 mills (m.)	=	1 cent (c.).
10 cents	=	1 dime (d.).
10 dimes	=	1 dollar ($).
10 dollars	=	1 eagle (e.).

108. In this currency, the *dollar* is the *unit*, cents and mills being *decimals* of a dollar. Thus, $4.15 represents four dollars and fifteen cents; $5.065 represents five dollars, six cents, and five mills. Fig-

ures at the right of the third decimal place represent *parts of a mill;* thus, $3.2534 = 3 dollars, 25 cents, 3 mills, and $\frac{4}{10}$ of a mill. The terms eagle and dime are not much used. Eagles and dollars are read together as dollars, and dimes and cents as cents; thus, $35.434 is read 35 dollars, 43 cents, 4 mills. Mills are often written and read as fractions of a cent; thus, $0.12\frac{1}{2}$, twelve cents and a half.

109. Reduction is the changing of a quantity to units of greater or less value without changing the value of the quantity expressed.

110. *Dollars are reduced to cents by moving the decimal point two places to the right, and to mills by moving the decimal point three places to the right. Thus* $5 = 500 *cents* = 5000 *mills.*

111. *Cents are reduced to dollars by moving the decimal point two places to the left. Mills are reduced to dollars by moving the decimal point three places to the left. Thus,* 5647 *cents* = $56.47; *and* 5647 *mills* = $5.647.

112. ORAL EXERCISES.

1. How many 5-cent pieces are equal in value to a 25-cent piece? How many to a quarter of a dollar? How many to a half-dollar?

2. What smaller pieces of money can be taken to equal a 25-cent piece?

3. What pieces of money can be used to pay a debt of 40 cents? Of 43 cents? Of 48 cents? Of 63 cents?

4. Reduce $5 to cents; to mills.

5. Reduce $6.18 to cents; to mills.

6. Reduce $1.435 to mills.
7. Reduce $4.25 to cents; to mills.
8. Reduce $18.17 to cents; to mills.
9. Reduce 625 cents to dollars.
10. Reduce 846 mills to dollars.
11. Reduce 173 cents to dollars.
12. Reduce 8756 cents to dollars.
13. Reduce 5432 mills to dollars.

Write the answers to the last ten examples.

113. Instead of multiplying by the number expressing the number of cents, in practice we often use the common fractions in the following

TABLE.

$0.50	$= \frac{1}{2}$ of a dollar.	$0.80	$= \frac{4}{5}$ of a dollar.
$0.33\frac{1}{3}$	$= \frac{1}{3}$ of a dollar.	$0.16\frac{2}{3}$	$= \frac{1}{6}$ of a dollar.
$0.66\frac{2}{3}$	$= \frac{2}{3}$ of a dollar.	$0.83\frac{1}{3}$	$= \frac{5}{6}$ of a dollar.
$0.25	$= \frac{1}{4}$ of a dollar.	$0.12\frac{1}{2}$	$= \frac{1}{8}$ of a dollar.
$0.75	$= \frac{3}{4}$ of a dollar.	$0.37\frac{1}{2}$	$= \frac{3}{8}$ of a dollar.
$0.20	$= \frac{1}{5}$ of a dollar.	$0.62\frac{1}{2}$	$= \frac{5}{8}$ of a dollar.
$0.40	$= \frac{2}{5}$ of a dollar.	$0.87\frac{1}{2}$	$= \frac{7}{8}$ of a dollar.
$0.60	$= \frac{3}{5}$ of a dollar.		

14. What cost 48 pounds of tea at 0.62\frac{1}{2}$ a pound?

Solution. — 0.62\frac{1}{2}$ = $\frac{5}{8}$ of a dollar. If a pound costs $\frac{5}{8}$ of a dollar, 48 pounds will cost 48 times $\frac{5}{8}$ of a dollar, or $\frac{5}{8}$ of 48 dollars, or $30, Ans.

114. The rules given for operations in Decimals apply to operations in United States Money.

15. If John buys a ball for $0.45, a bat for $0.25, and a belt for $1, what must he pay for all? How much change ought he to receive if he pays with a $2 bill?

16. At $0.12½ a pound, what will 8 pounds of sugar cost?

17. At $0.37½ a yard, what will 4 yards of cloth cost?

18. If I buy nuts at 8½ cents a pound and sell them for 10 cents a pound, how much shall I gain on 12 pounds?

19. If you give a 50-cent piece to pay for 10 oranges at 3 cents each, what pieces of money may you receive as change?

20. If you give a 50-cent piece to pay for 4 pounds of sugar at 9 cents a pound, what pieces of money may you receive as change?

21. How many pounds of sugar at 5 cents a pound can be bought for 2 dozen eggs at 12½ cents a dozen?

22. At $0.12½ a pound, what will 16 pounds of beef cost?

23. A woman paid $0.87½ for cotton cloth and $0.62½ for some ribbon. How much did she pay for both?

24. If I pay $0.37½ a pound for coffee, and sell it for 40 cents a pound, how much shall I gain on 15 pounds?

25. At 16⅔ cents a pound, what will a turkey cost that weighs 15 pounds?

26. Bought a dozen handkerchiefs at 33⅓ cents apiece, what ought I to pay for them?

27. If a blacksmith gets $0.33⅓ per hour, what does he receive for a day of 9 hours?

28. At 50 cents a bushel, what is the cost of 25 bushels of potatoes?

29. If a gentleman pays $35 for a suit of clothes, $4.50 for a pair of shoes, and $3.50 for a hat, how much does he pay for all?

30. At 25 cents a can, what will 36 cans of milk cost?

31. If Dr. Foster pays $25 a year for the use of his telephone, what would he pay in 9 years?

32. I sold an easy-chair for $7.35, and a book-case for $11.75. How much did I get for both?

33. At 16⅔ cents a pound, how much cheese can I buy for $1.50?

34. If I sell a piece of broadcloth containing 27 yards for $135, how much do I get a yard?

35. If a boy has $5, and pays out of it $2.87, how much will he have left?

115. WRITTEN EXERCISES.

36. At $6.50 a ton, how much must be paid for 8¾ tons of coal?

37. If $8.75 is paid for 35 pounds of butter, what is the price a pound?

38. If I pay $125 for a horse, $25.25 for a saddle, $62.50 for a wagon, and $18.75 for a harness, what do I pay for all?

39. Mr. Johnson owed Mr. Howe $75.43. Afterward he paid him $14.35, and again $54.72. How much did he still owe Mr. Howe?

40. What cost 4½ yards of ribbon at 43 cents a yard?

41. At $5.50 a ton, how many tons of coal can be bought for $132?

42. How many cords of wood at $5.25 a cord must be given for 5¼ yards of broadcloth at $4.25 a yard?

43. If a cheese weighing 87 pounds costs $12.61, what does it cost a pound?

44. A drover bought 2 cows at $37.50 each, 3 heifers at $18 each, and 19 sheep at $4.50 each. What ought he to pay for all?

45. A man paid $14.44 for a firkin of butter containing 38 pounds. How much did he pay a pound?

46. How many pounds of beef can be bought for $5.94, at 18 cents a pound?

47. A farmer fed out in the month of January 75 bushels of corn, in February 105 bushels, in March 96 bushels, in April 84 bushels. At $0.65 a bushel how much did this corn cost him?

48. A man having $7500, paid $5050 for a farm, and $1275 for stock. How much money had he left?

49. If a dozen lemons cost 15 cents, how many dozen can be bought for $6.75?

50. A minister received a salary of $1000; his rent was $175, and other expenses $537. How much did he save?

51. Mr. Bacon had $1250 in the bank; he drew out at one time $275.87, at another $387.45, and at another $125.75. How much money did he have remaining in the bank?

52. A man bought a house for $1355, and after paying $237 in repairs, sold it for $1825. How much did he gain?

53. A girl in entering the Grammar-school paid 75 cents for a reader, $1.10 for a geography, 90 cents for a grammar, 38 cents for a speller, and 50 cents for an arithmetic. How much did she pay for these books?

What is the value of

54. 275 acres of land at $45 an acre?

55. 25 thousand shingles at $5.50 a thousand?

56. 12 thousand bricks, at $6.50 a thousand?

57. 27 thousand feet of timber at $13.75 a thousand?

Find how much must be paid

58. For 124 cans of milk at 24 cents a can.
59. For 87 dozen of eggs at 28 cents a dozen.
60. For 75 barrels of apples at $1.50 a barrel.
61. For 27 boxes of tomatoes at $0.45 a box.
62. For 157 cabbages at 9 cents a head.
63. For 84 bushels of potatoes at $0.95 a bushel.
64. For 218 pounds of veal at 14 cents a pound.
65. For 584 pounds of pork at 10 cents a pound.
66. For 15 tons of coal at $7.25 a ton.
67. For 17 bags of meal at $1.15 a bag.
68. For 12 bushels of oats at 48 cents a bushel.
69. For 13 tons of hay at $15.50 a ton.
70. For 27 yards of carpet at $1.25 a yard.
71. For 96 yards of cotton cloth at 6 cents a yard.
72. For 37 yards of broadcloth at $2.75 a yard.
73. For 278 pounds of beef at 11 cents a pound.
74. For 68 barrels of flour at $5.50 a barrel.
75. For 85 pounds of tea at 65 cents a pound.
76. For 96 pounds of cheese at 14 cents a pound.
77. For 312 pounds of coffee at 32 cents a pound.
78. For 238 pounds of crackers at $0.10 a pound.
79. For 38 barrels of apples at $1.25 a barrel.
80. For 96 bushels of cranberries at $3.25 a bushel.
81. For 89 bags of meal at $1.15 a bag.
82. For 79 bags of shorts at 96 cents a bag.
83. For 162 gallons of molasses at $0.63 a gallon.
84. For 186 gallons of kerosene at $0.13 a gallon.
85. For 412 gallons of vinegar at $0.25 a gallon.
86. For 128 pounds of oatmeal at 4 cents a pound.
87. For 78 quarts of blueberries at $0.12 a quart.
88. For 102 quarts of blackberries at $0.13 a quart.
89. For 174 quarts of raspberries at $0.16 a quart.
90. For 78 cords of wood at $6.25 a cord.
91. For 108 tons of coal at $4.75 a ton.

Find the price of one barrel, one quart, etc.,

92. If 18 barrels of apples cost $22.50.
93. If 42 quarts of cherries cost $5.46.
94. If 25 barrels of flour cost $131.25.
95. If 138 pounds of nuts cost $15.18.
96. If 175 quarts of raspberries cost $28.
97. If 96 pounds of tea cost $59.52.
98. If 104 quarts of blackberries cost $13.52.
99. If 71 quarts of blueberries cost $8.52.
100. If 108 pounds of cheese cost $14.04.
101. If 96 pounds of coffee cost $30.72.
102. If 45 pounds of crackers cost $4.95.
103. If 112 pounds of oatmeal cost $5.04.
104. If 56 gallons of vinegar cost $10.08.
105. If 35 bushels of cranberries cost $108.85.
106. If 250 cabbages cost $18.75.
107. If 76 heads of lettuce cost $6.27.
108. If 96 gallons of kerosene cost $15.36.
109. If 52 gallons of molasses cost $37.44.
110. If 98 bags of meal cost $102.90.
111. If 93 bags of shorts cost $71.61.
112. If 73 bags of corn cost $45.26.
113. If 96 cords of wood cost $624.
114. If 53 tons of coal cost $278.25.
115. If 113 cans of milk cost $28.25.
116. If 75 dozen of eggs cost $20.25.
117. If 14 barrels of apples cost $22.40.
118. If 65 bushels of potatoes cost $33.15.
119. If 613 pounds of beef cost $85.82.
120. If 15 tons of coal cost $86.25.
121. If 34 yards of carpet cost $25.50.
122. If 316 pounds of sugar cost $14.22.
123. If 43 yards of broadcloth cost $75.25.
124. If 24 rolls of paper cost $20.88.
125. If 16 pairs of gloves cost $22.72.

BILLS.

116. **A Bill of Goods** is a written statement of articles sold, containing the date of each sale, the name of the purchaser and of the seller, the quantity and the price of each article, and the cost of the whole.

117. A **Debtor** (Dr.) is a person who owes a debt.

118. A **Creditor** (Cr.) is a person to whom a debt is owed.

119. A bill when paid is **receipted** by the creditor, or some person authorized by him, acknowledging the payment in writing. (See Bills, Nos. 126 and 127.)

120. Find the cost of the several articles, and the total amount due on each of the following bills.

(126.)

Boston, May 15, 1895.

Mr. P. C. Porter,

1895. To WHITING & SMITH, Dr.

Mar.	*4.*	*5 yds.*	*Flannel*	@ $	*0.50*	$
"	"	*5* "	*Cotton*	"	*0.10*	
"	"	*3* "	*Crash*	"	*0.12*	
"	"	*2 doz.*	*Collars*	"	*2.00*	
"	"	*2 prs.*	*Cuffs*	"	*0.25*	
"	"	*3* "	*Hose*	"	*0.35*	

Rec'd Payment,

Whiting & Smith.

(127.)

Lowell, May 30, 1895.

Mr. Joseph Smith,

1895. **Bought of J. W. HIGGINS.**

Apr. 2.	*20 lbs.*	*Sugar*	@ $*0.08*	$	
" "	*5* "	*Java Coffee*	" *0.35*		
" "	*3* "	*Rice*	" *0.10*		
		Cr.			
" "	*2* "	*Butter*	" *0.25*		
" "	*3 doz.*	*Eggs*	" *0.24*		

Rec'd Payment,

J. W. Higgins.
By Josiah McKenzie.

(128.)

Holden, July 24, 1895.

Mr. John Kenrick,

1895. **To ROBERT SNOW, Dr.**

	To 6 days work	@ $*1.50*	$	
	Cr.			
July 31.	*Cash*		*2*	*50*
	Balance due			

Rec'd Payment,

Robert Snow.

(129.)

Sherborn, July 3, 1895.

Mr. Charles F. Gray.

1895. To WALTER T. BACON, Dr.

To 6 Cords of Hard Wood	@ $7		$

Rec'd Payment,

Walter T. Bacon

(130.)

Westminster, Aug. 6, 1895.

Mr. Edwin F. Cate,

1895. To ALDEN T. FULLER, Dr.

July 23.	80 bush.	Western Corn	@	$0.80	$
" "	100 "	Rye	"	1.10	
" "	200 "	Oats	"	0.65	
" "	10 bbls.	Rye Flour	"	7.00	
" "	20 "	Wheat Flour	"	9.00	

(131.)

Springfield, Sept. 8, 1894.

Messrs. E. James & Co.,

1894. To ROBERT COGAN, Dr.

July 7.	4 bush.	Oats	@	$0.46	$
" "	5 "	Corn	"	0.62	
Aug. 4.	3 bags	Meal	"	1.10	
" 11.	8 "	Shorts	"	0.95	

132. O. N. Barber sold George Battelle 2½ cords of wood at $4.50 a cord. Make out Mr. Barber's bill.

133. Make out Geo. M. Smith's bill against Wallace A. Colcord for two pairs of skates at $3.50.

134. Thomas McGill takes care of a schoolroom, in Springdale, for $5 a term. Make out his bill for the spring term against the town, and receipt it.

135. John Gray worked for E. P. Wood 5 days at 75 cents a day; he received during the time $1.25 in cash. Make out his bill.

136. Suppose yourself a clerk in the grocery store of E. C. Clark & Co. You sell Asa Talbot 16 pounds of sugar at 6 cents a pound, 3 pounds of coffee at 33⅓ cents a pound, ½ pound of tea at 60 cents a pound, 3 pounds of crackers at 10 cents a pound. Mr. Talbot pays cash. Make out Mr. Talbot's bill.

137. George H. Bigelow sold William Locke & Son 127 barrels of apples at $1.25 a barrel. Make out Mr. Bigelow's bill.

138. Freeman Parmenter hired Frank Williams for 7 months at $20 a month. He paid him during the time $25 in cash. Make out Mr. Williams' account.

139. Make out and receipt Joseph Smith's bill against the town of Dover for 22 cords of hard wood at $6.50 a cord, and 7 cords of pine wood at $5.25 a cord.

140. Chas. H. Smith bought of George D. Everett, a grocer, 15 pounds of sugar at 7 cents a pound, 2 bags of meal at $1.10 a bag, 3 gallons of kerosene at 25 cents a gallon, 5 pounds of cheese at 14 cents a pound. He sold him 8 pounds of butter at 25 cents a pound, 3 dozen eggs at 27 cents a dozen, 9 pounds of poultry at 18 cents a pound. Make out Mr. Everett's bill.

COMPOUND NUMBERS.

121. The following tables of weights and measures are now generally used in the United States.

122. LINEAR MEASURE.

12 inches (in.)	=	1 foot (ft.).
3 feet	=	1 yard (yd.).
5½ yards, or 16½ feet	=	1 rod (rd.).
320 rods, or 5280 feet	=	1 mile (m.).

123. ORAL EXERCISES.

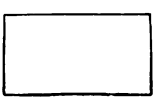
1. How many inches in 5 feet?
2. How many inches in 7 feet 5 inches?
3. How many yards in 48 inches?
4. How many inches in 1 yard?
5. If a man steps just 1 yard, how many feet will he go in 12 steps?
6. How many inches in 1½ yards?
7. At 8 cents a yard, what ought to be paid for 4 yards and 9 inches of ribbon?
8. Cut off a piece of paper, or a stick, exactly an inch in length. Six inches in length.
9. How many inches is this page in width? In length?
10. How many inches long is your desk? How many feet?
11. How many feet tall are you? How many inches?
12. How many yards is it round this room? How many feet?

124. SQUARE MEASURE.

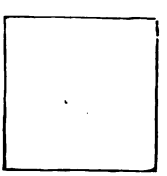
144	square inches (sq. in.)	= 1 square foot (sq. ft.).
9	square feet	= 1 square yard (sq. yd.).
30¼	square yards, or 272¼ square feet	= 1 square rod (sq. rd.).
160	square rods	= 1 acre (a.).
640	acres	= 1 square mile (sq. m.).

NOTE. The units of square measure, so far as they are the same in name, are obtained by squaring (that is, taking twice as a factor) the units of the table of linear measure.

125. A **Rectangle** is a plane (or flat) surface bounded by four straight lines and having all its angles equal.

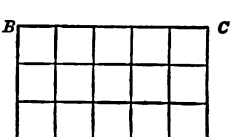


126. The figure is called *rectangular*, and the angles *right angles*.



127. A **Square** is a rectangle whose sides are equal.

128. To find the area of a rectangle.



Let $A\,B\,C\,D$ be a rectangle whose base $A\,D$ is 5 inches in length, and whose altitude $A\,B$ is 3 inches. If $A\,D$ is divided into 5 equal parts and $A\,B$ into 3, and lines are drawn through the points of division, the rectangle will be divided into squares, each containing 1 square inch; and the rectangle will evidently contain 5×3, or 15, of these squares; that is, its area = (5×3) square inches = 15 square inches. Therefore,

The area of a rectangle is the product of its base and altitude.

129. The area of a rectangle divided by the length will give the breadth, and the area divided by the breadth will give the length.

130. ORAL EXERCISES.

13. How many square feet in a board 9 feet long and 2 feet wide?

14. How many square feet in 8 square yards? In 9? In 10? In 12?

15. How many square feet in a ceiling 10 feet long and 8 feet wide?

16. How many square inches in a pane of glass 10 inches by 15 inches?

17. How many square feet in the largest window in the room in which you are now sitting?

18. What part of a square yard is 1 square foot? 2 square feet? 3? 4? 5?

19. How many square rods in a quarter of an acre? In half an acre?

20. How many square rods in a piece of land 8 rods in length and 9 rods in width?

21. What must be the width of a board that is 7 feet long that it may contain 21 square feet?

22. At 2 cents a square foot what must I pay for a board 12 feet long and 8 inches wide?

23. How much must be paid for 60 square rods of land at $90 an acre?

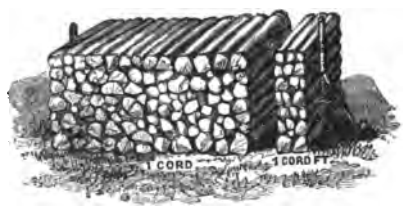
131. SOLID OR CUBIC MEASURE.

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.).

NOTE. The units of this table are obtained by cubing (that is, taking three times as a factor) the units of the table of linear measure.

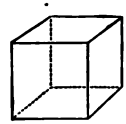
132. WOOD MEASURE.

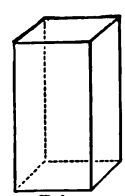
16 cubic feet	=	1 cord foot (cd. ft.).
8 cord feet, or 128 cubic feet	=	1 cord (cd.).



133. A **Rectangular Prism** is a solid bounded by six rectangles.

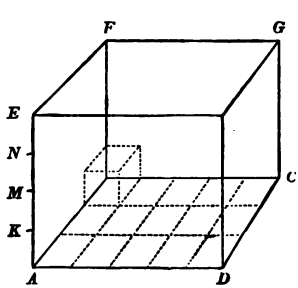
134. A **Cube** is a rectangular prism bounded by squares.


Cube.


Prism.

135. To find the volume of a rectangular prism.

Let $A\,B\,C\,D, E\,F\,G\,H$ be the rectangular prism whose base is a rectangle 5 inches from A to D, and 3 from A to B, and whose altitude $A\,E$ is 4 inches.



The rectangle $A\,B\,C\,D$ contains (5×3) square inches (Art. 128). If parallel to the base $A\,B\,C\,D$ a plane is passed through the point K, one inch from A, it will evidently cut off

15 cubic inches, that is, $(5 \times 3 \times 1)$ cubic inches. If, in like manner, a plane passes through M, it will cut off 15 more; and so on. That is, the rectangular prism contains $(5 \times 3 \times 4)$ cubic inches $= 60$ cubic inches. Therefore,

The volume of a rectangular prism is equal to the product of its three dimensions.

136. The volume of a rectangular prism divided by the area of its base will give the altitude; the volume divided by the area of one end will give the length; and the volume divided by the area of one side will give the breadth or width.

137. ORAL EXERCISES.

24. How many cubic feet in a third of a cubic yard?

25. How many cubic feet in a cube whose edge is 3 feet?

26. How many cord feet in half a cord?

27. How many cubic feet in a rectangular cistern 8 feet long, 3 feet deep, and 2 feet wide?

28. What part of a cord is 1 cord foot? 2 cord feet? 3? 5? 6?

29. How many cubic feet in 2 cord feet and 5 cubic feet?

30. What will 6 cord feet of wood cost at $8 a cord?

138. LIQUID MEASURE.

4 gills (gi.) = 1 pint (pt.).
2 pints = 1 quart (qt.).
4 quarts = 1 gallon (gal.).

139. DRY MEASURE.

2 pints (pt.) = 1 quart (qt.).
8 quarts = 1 peck (pk.).
4 pecks = 1 bushel (bush.).

140. ORAL EXERCISES.

31. How many gills in 3 quarts?
32. How many quarts in a bushel?
33. How many pints in a gallon?
34. At 6 cents a quart, what ought to be paid for 4 qt. 1 pt. of milk?
35. How many pecks are there in 5 bushels?
36. How many gallons are there in 42 quarts?
37. How many quarts are there in $\frac{3}{8}$ of a bushel?

141. AVOIRDUPOIS WEIGHT.

16 ounces (oz.)	=	1 pound	(lb.).
2000 pounds	=	1 ton	(t.).

142. ORAL EXERCISES.

38. How many pounds in 32 ounces?
39. How many ounces in 3 pounds?
40. How many pounds in 5 tons?
41. At 12 cents a pound what ought to be paid for 4 pounds and 4 ounces of nuts?
42. What part of a pound is 2 ounces? 8 ounces? 12 ounces?
43. What part of a ton is 500 pounds? 1000 pounds? 1500 pounds?

143. TIME MEASURE.

60 seconds (sec.)	=	1 minute	(m.).
60 minutes	=	1 hour	(h.).
24 hours	=	1 day	(d.).
7 days	=	1 week	(wk.).
365 days	=	1 common year	(c. yr.).
366 days	=	1 leap year	(l. yr.).
100 years	=	1 century	(C.).

The names of the months, called calendar months, and the number of days in each are:

1. January (Jan.)	31	7. July	31
2. February (Feb.)	28 or 29	8. August (Aug.)	31
3. March (Mar.)	31	9. September (Sept.)	30
4. April (Apr.)	30	10. October (Oct.)	31
5. May	31	11. November (Nov.)	30
6. June	30	12. December (Dec.)	31

NOTE 1. The number of days in each month may be easily remembered by committing the following lines: —

"Thirty days hath September,
April, June, and November;
All the rest have thirty-one,
Except the second month alone,
Which has but twenty-eight, in fine,
Till leap year gives it twenty-nine."

144. According to the Gregorian Calendar, by which we reckon time, there is a leap year whenever the number representing the year (A. D.) is divisible by 4 and not by 100, and also when it is divisible by 400. Thus, 1892 was a leap year, 1894 not, 1600 was a leap year, 1700 and 1800 not.

145. ORAL EXERCISES.

44. How many days in 3 weeks? In 4 weeks?
45. How many hours in 2 days? In 3 days?
46. How many minutes in 4 hours? In 5 hours?
47. How many weeks in 35 days? In 56 days?
48. Was 1880 a leap year? 1881? 1882? 1894?
49. How many days were there in Feb. 1896?
50. How many days are there in June, July, and August?
51. How many hours are there from March 31, 9 P. M., to April 1, 8 A. M.?
52. How many days are there from Aug. 16 to Sept. 5?

146. WRITTEN EXERCISES.

53. How much will it cost to build a fence a distance of 25 rods and 5 feet, on both sides of a road, at $0.42 a foot?

54. How many steps, of $2\frac{1}{2}$ feet each, must a man take to walk half a mile?

55. The top of Mt. Cotopaxi is 18875 feet above the level of the sea. What is its height in miles?

56. How many yards in a mile?

57. How many square feet in the four sides of a room 15 feet long, 10 feet wide, and 8 feet high?

58. How many square feet in an acre?

59. At $75 an acre, what will 5 acres and 50 square rods of land cost?

60. What will it cost for a carpet for a room 18 feet long and 12 feet wide, if the carpet is a yard wide and costs $0.90 a yard?

61. What will it cost to make a blackboard 15 feet long and $4\frac{1}{2}$ feet wide, at $0.09 a square foot?

62. How many square feet are there in a rectangular lot of land 150 feet long and 35 feet wide?

NOTE. — **A Board Foot** is a square foot one inch in thickness. This is the unit for measuring lumber, or sawed timber. When lumber is more than an inch in thickness, the number of board feet is found by *multiplying the square feet in the surface of one face by the number expressing the number of inches it is in thickness.* Boards less than an inch in thickness are reckoned as though they were an inch in thickness.

63. How many feet, board measure, in a plank 12 feet long, 15 inches wide, and $2\frac{1}{2}$ inches thick?

$(12 \times 1\frac{1}{4} \times 2\frac{1}{2})$ bd. ft. $= 37\frac{1}{2}$ bd. ft. Ans.

64. How many feet board measure in a board 16 feet long, 15 inches wide, and $\frac{1}{2}$ inch thick?

Ans. 20 bd. ft.

65. How many feet board measure in 25 boards, each 13 feet long, 14 inches wide, and $1\frac{1}{4}$ inches thick?

66. How many feet board measure in 10 pieces of timber, each 35 feet long, 6 inches wide, and 4 inches thick?

67. How many feet board measure in 4 boards each 15 feet long, 18 inches wide, and $\frac{7}{8}$ inch thick?

68. Find the cost of a lot of land containing half an acre, at $0.17 a square foot.

69. How many cubic inches of air in a room 35 feet long, 20 feet wide, and 11 feet high?

70. At $6 a cord, what will 17 cords and 5 cord feet of wood cost?

71. How many cords of wood are there in a pile 24 feet long, 4 feet wide, and 5 feet high?

72. If a family use 2 quarts and 1 pint of milk a day, how many quarts will they use in the three spring months?

73. A marketman sold 8 bushels, 3 pecks, 5 quarts of strawberries at $0.15 a quart. What did he receive for them?

74. At 6 cents a pound, how many tons of rice can be bought for $180?

75. What will 1540 pounds of hay be worth at $18 a ton?

76. If a horse eats 25 pounds of hay a day, how many tons will he eat in a year of 365 days?

77. How many hours are there in a year of 365 days?

78. How many minutes are there in January?

79. How many hours are there in March, April, and May?

80. Find the exact number of days from June 16, 4 P. M., to Sept. 9, 10 A. M.

		Days.	Hours.
June 16, 4 P. M.,	to July 16, 4 P. M.,	30	
July 16, " "	" Aug. 16, " "	31	
Aug. 16, " "	" Sept. 8, " "	23	
Sept. 8, " "	" Sept. 9, 10 A. M.,	0	18
	Ans.	84	18

81. Find the exact number of days from April 21, 8 A. M., to Aug. 29, 4 P. M.

82. Find the exact number of days from Dec. 19, 1894, 5 P. M., to March 8, 1895, 8 A. M.

83. What is the difference of time between April 17, 1892, and Oct. 9, 1895?

SOLUTION. — From April 17, 1892, to April 17, 1895, is 3 years; from April 17 to Sept. 17 is 5 months; Sept. 17 to Sept. 30 is 13 days; and from Sept. 30 to Oct. 9 is 9 days. Hence, from April 17, 1892, to Oct. 9, 1895, is 3 yrs. 5 m. 22 d. *Ans.* Hence, to find the difference of time between two dates,

Rule.

Find the number of complete years, then the number of complete calendar months, and then the remaining days.

84. What is the difference of time between July 19, 1893, and Oct. 4, 1895?

85. What is the difference of time between Aug. 30, 1891, and May 17, 1895?

86. What is the difference of time between Dec. 18, 1894, and Feb. 7, 1895?

87. How long was it from the death of Daniel Webster, Oct. 24, 1852, to the death of Abraham Lincoln, April 15, 1865?

147. ORAL EXERCISES.

1. How many inches are there in half a rod?
2. How many square feet are there in 6 square yards?
3. How many square inches are there in a book-cover 5 inches wide and 8 inches long?
4. How many cubic feet are there in a cubical block of stone 7 feet long, 3 feet wide, and $1\frac{1}{2}$ feet thick?
5. How many gallons are there in 33 quarts?
6. If a bushel of apples is worth \$1.60, what is half a peck worth?
7. How many gills are there in 5 quarts?
8. How many tons are there in 6000 pounds?
9. At 12 cents a pound, what should be paid for $8\frac{1}{2}$ pounds of nuts?
10. How many days are there in 8 weeks?
11. How many days were there in February, 1892? 1893? 1894?
12. How many hours are there from July 31, 3 P.M., to Aug. 2, 11 A.M.?
13. At \$6 a ton, what will $5\frac{5}{6}$ tons of coal cost?
14. At \$8.40 a cord, what will 2 cords and 2 cord feet of wood cost?
15. In 45 gills how many pints?
16. How many quarts are there in $\frac{5}{16}$ of a bushel?
17. If $\frac{3}{8}$ of a pound of sugar costs 3 cents, what will 5 pounds and 4 ounces cost?
18. What part of a bushel is 8 quarts?
19. How many cords are there in 28 cord feet?
20. How many square rods are there in $\frac{3}{8}$ of an acre?
21. How many inches are there in $1\frac{1}{9}$ yards?
22. What part of a ton is 1200 pounds?

23. What will 5 cord feet of wood cost at $6 a cord?

24. In a plank 2 inches thick, 5 feet long, and 2 feet wide, how many feet, board measure, are there?

25. At $5 a ton, what will 5 tons and 1500 pounds of coal cost?

26. What part of a pound is 10 ounces? 14 ounces?

27. How many days are there from July 8 to Aug. 5?

28. How many steps must a man take to walk 2 rods, if he passes over a yard at each step?

29. How many gallons are there in 37 quarts?

30. How many pounds in 26 ounces?

31. How many hours are there from Dec. 30, 5 P. M., to Jan. 1, 11 A. M.?

32. At 15 cents a yard, what ought to be paid for 5 yards and 12 inches of ribbon?

33. At 3 cents a square foot, how much must I pay for a board 5 feet long, 6 inches wide, and 1 inch thick?

34. How many minutes from 8.25 A. M. to 10.13 A. M.?

35. If a cubical block of marble 6 feet long, and 2 feet 4 inches thick, contains 35 cubic feet, how wide is it?

36. How many days are there from Aug. 28 to Oct. 3?

37. How many bushels are there in 19 pecks?

38. I paid 15 cents for a board an inch thick and 5 feet long, and worth 2 cents a square foot. How wide was the board?

39. How many cubic feet in half a cubic yard? in two thirds of a cubic yard? in three fourths?

40. How many pecks are there in 18 quarts? in 20 quarts? in 24 quarts? in 30 quarts?

148. WRITTEN EXERCISES.

41. How many rods are there round a rectangular garden 96 feet long and 60 feet wide?

42. A has walked 15840 feet, and B 4 miles. How much farther has B walked than A?

43. How many cords are there in a pile of wood 25 feet long, 4 feet wide, and 6 feet high?

44. If 24 sheets make a quire, and 20 quires make a ream, how many sheets of paper are there in 64 reams?

45. How many ounces are there in 11 pounds? in 13 pounds? in 19 pounds? in 23 pounds?

46. If a peck of berries is worth 33 cents, what are 4 bushels worth?

47. A lady paid $8 for ice-cream, at $0.40 a quart. How many gallons did she buy?

48. How many pounds are there in 288 ounces?

49. No allowance being made for waste, how many yards of carpet that is $\frac{3}{4}$ of a yard wide will it take to carpet a room 20 feet long and 13 feet wide?

50. How much must be paid for 8 bushels of peas at $0.37 a peck?

51. What will 3500 pounds of coal cost at $7.50 a ton?

52. A barrel of beef contains 200 pounds. At $15 a barrel, what will 1700 pounds of beef cost?

53. At $0.72 a gallon, what will 2 gallons, 2 quarts, and 1 pint of molasses cost?

54. The walk in front of Mr. Fiske's house is 45 feet long and 4 feet wide. How many square yards does it contain?

55. Mr. Meade bought a rectangular lot of land, which was 150 feet deep and 2 rods on the front, at $0.18 a square foot. What did it cost him?

56. A man sold 3 bushels, 3 pecks, and 3 quarts of chestnuts at 64 cents a peck. What did he get for them?

57. What would it cost to paint (both sides of) a fence that is 10 rods long and 5 feet high, at $0.75 a square yard?

58. If a rectangular lot of land, 75 feet wide, contains 6375 square feet, how long is it?

59. How many cords are there in 576 cubic feet?

60. How many feet are there in 18 rods?

61. What will a bushel of cranberries cost at $0.12 cents a quart?

62. How many cords of wood are there in a pile 22 feet long, 4 feet wide, and $3\frac{1}{2}$ feet high? What is it worth at $5 a cord?

63. If $2\frac{1}{2}$ pecks of berries are worth $2.40, what is a bushel worth?

64. Find the number of cubic feet in a rectangular cistern 12 feet long, 4 feet wide, and 8 feet deep.

65. In a gallon there are 231 cubic inches. How many gallons of water will the cistern, whose dimensions are given in the preceding example, hold?

66. How many feet, board measure, in a plank 18 feet long, $2\frac{1}{2}$ inches thick, and 2 feet wide?

67. How many board feet in a joist 12 feet long, 4 inches wide, and 3 inches thick?

68. A beam is 24 feet long, 4 inches wide, and 4 inches thick. How many board feet does it contain?

69. William Cullen Bryant was born Nov. 3, 1794, and died June 12, 1878. What was his age?

Find the time, in years, months, and days:

70. From the Declaration of Independence, July 4, 1776, to April 19, 1895.

71. From Dec. 24, 1894, to Nov. 13, 1895.

72. From Jan. 3, 1892, to Dec. 25, 1894.

PERCENTAGE.

149. ORAL EXERCISES.

1. What is $\frac{1}{100}$ of \$100? $\frac{2}{100}$? $\frac{5}{100}$? $\frac{20}{100}$?
2. What is $\frac{1}{100}$ of \$200? $\frac{2}{100}$? $\frac{6}{100}$? $\frac{20}{100}$?
3. What is $\frac{5}{100}$ of \$400? of \$500? of \$800?
4. How many hundredths of \$100 is \$1? \$2? \$5?
5. How many hundredths of \$100 is \$15? \$20? \$40? \$50? \$60? \$75?
6. How many hundredths of anything is $\frac{1}{5}$ of it? $\frac{1}{4}$ of it? $\frac{1}{2}$ of it? $\frac{3}{5}$ of it? $\frac{3}{4}$ of it?
7. How many hundredths of anything is $\frac{2}{5}$ of it? $\frac{4}{5}$ of it? $\frac{1}{20}$ of it? $\frac{3}{20}$ of it? $\frac{2}{50}$ of it?

150. **Per cent** means *by the hundred.* Thus, *ten* per cent of a bushel of corn means ten hundredths of it; that is, ten parts out of every hundred parts; *six* per cent of a sum of money is six hundredths of the sum, that is, \$6 out of every \$100. Instead of the words *per cent* it is customary to use the sign, %; thus, 6 per cent is written 6 %; $4\frac{1}{2}$ per cent, $4\frac{1}{2}$ %.

151. The **Rate per cent,** or the **Rate,** is the number of hundredths. Thus, 6 % is $\frac{6}{100}$, or 0.06, that is, 6 parts of each hundred parts.

152. The **Percentage** is such part of any given sum as is represented by the rate. Thus, the percentage on \$200 at 6 per cent is \$12.

153. The **Rate,** being a certain number of hundredths, may be expressed either *decimally,* or by a *common fraction,* as in the following

TABLE.

1	per cent	or	1	%	is	0.01	=	$\frac{1}{100}$.
2	"	"	2	%	"	0.02	=	$\frac{1}{50}$.
5	"	"	5	%	"	0.05	=	$\frac{1}{20}$.
$6\frac{1}{4}$	"	"	$6\frac{1}{4}$	%	"	0.0625	=	$\frac{1}{16}$.
$8\frac{1}{3}$	"	"	$8\frac{1}{3}$	%	"	$0.08\frac{1}{3}$	=	$\frac{1}{12}$.
$12\frac{1}{2}$	"	"	$12\frac{1}{2}$	%	"	0.125	=	$\frac{1}{8}$.
$16\frac{2}{3}$	"	"	$16\frac{2}{3}$	%	"	$0.16\frac{2}{3}$	=	$\frac{1}{6}$.
20	"	"	20	%	"	0.20	=	$\frac{1}{5}$.
25	"	"	25	%	"	0.25	=	$\frac{1}{4}$.
$33\frac{1}{3}$	"	"	$33\frac{1}{3}$	%	"	$0.33\frac{1}{3}$	=	$\frac{1}{3}$.
50	"	"	50	%	"	0.50	=	$\frac{1}{2}$.
$66\frac{2}{3}$	"	"	$66\frac{2}{3}$	%	"	$0.66\frac{2}{3}$	=	$\frac{2}{3}$.

NOTE. When the per cent is expressed by a decimal of more than two places, the figures after the second decimal place are parts of 1 per cent. Thus, 0.125 is $12\frac{5}{10}$, or $12\frac{1}{2}$, per cent.

154. EXERCISES.

8. Write 5 per cent decimally.

9. Write as decimals 6 %; 9 %; 15 %; 23 %; 44 %.

10. Write the fraction for 4 %; 8 %; 10 %; 30 %; 40 %; 50 %; 60 %; 75 %.

11. What per cent of anything is $\frac{1}{5}$ of it? $\frac{3}{5}$? $\frac{3}{10}$? $\frac{7}{10}$? $\frac{9}{10}$? $\frac{2}{25}$? $\frac{4}{25}$? $\frac{3}{50}$? $\frac{7}{50}$? $\frac{6}{50}$?

12. What per cent of anything is $\frac{1}{4}$ of it? $\frac{1}{2}$? $\frac{3}{4}$?

13. What part of anything is 5 % of it? 8 %? $12\frac{1}{2}$ %? 20 %? 25 %? $33\frac{1}{3}$ %? 100 %?

14. What is 5 % of \$8? 6 %? 7 %? 9 %?

Solution. — 5 % of \$8 is $\frac{5}{100}$ of \$8, or $\frac{40}{100}$ of \$1 = \$0.40, Ans. Or, 5 % of \$1 is $\frac{5}{100}$ of \$1, or 5 cents; and therefore 5 % of \$8 is 8 times 5 cents, or 40 cents, Ans.

15. What is 4 % of \$4? of \$5? of \$6? of \$7? of \$8? of \$10? of \$11? of \$12?

16. What is 3 % of \$7? of \$9? of \$12? of \$15? of \$20? of \$30? of \$40? of \$50?

17. What is 10 % of $8? of $10? of $11? of $18?

18. What is 20 % of $1? of $2? of $5? of $10?

19. In a school of 50 scholars it was reported that 4 % were absent. How many scholars were absent?

20. Mr. Anthony pays 10 cents a yard for prints, and sells them at 10 % advance. What does he get a yard for the prints?

155. WRITTEN EXERCISES.

21. A man whose annual income is $1343 spends 25 % of it. How many dollars does he spend?

$1343
0.25
6715
2686
$335.75, Ans.

As 25 % is 0.25 = $\frac{1}{4}$, the amount he spends is found by multiplying $1343 by 0.25, or by taking $\frac{1}{4}$ of it.

Or,

$1343 × $\frac{1}{4}$ = 335\frac{3}{4}$, Ans.

22. What is 33$\frac{1}{3}$ % of $916.20?

23. Find 20 % of 455 bushels of oats.

24. If a man buys a pair of oxen for $125 and sells them so as to gain 12$\frac{1}{2}$ %, what does he receive for them?

25. Find 8 % of $427; 9 %; 15 %.

26. For immediate payment Mr. Waters gets 5 % deduction from a bill of $67.44. What does he save by paying at once, and how much does he pay?

27. How must I sell goods that cost 30 cents a yard so as to gain a profit of 5 %? 10 %? 12$\frac{1}{2}$ %? 20 %? 25 %? 33$\frac{1}{3}$ %? 50 %?

28. Mr. James bought flour at $5.75 a barrel, and sold it so as to gain 12 %. How much profit did he make on each barrel, and how much did he receive for each barrel?

29. If I sell $545.20 worth of goods at 5 % commission for selling, what is the commission?

156. ORAL EXERCISES.

30. What part of $5 is $2? Ans. $\frac{2}{5}$.

31. How many hundredths of $5 is $2?

$\frac{2}{5} = \frac{40}{100}$, Ans.

32. What per cent of $5 is $2? Ans. 40 %.

33. What per cent of $12 is $3?

$3 = $ $\frac{3}{12}$ of $12: $\frac{3}{12} = \frac{1}{4} = \frac{25}{100}$. 25 %, Ans.

34. What per cent of $8 is $4?

35. If a boy pays 25 cents for a knife and sells it for 30 cents, what per cent does he gain?

36. Of 30 words John misspelled 3. What per cent did he misspell?

37. A man borrowed $25 and paid $2 for the favor. What per cent did he pay?

38. Of 12 chickens 3 were stolen. What per cent remained?

39. If a man sells anything for twice as much as it cost him, what per cent does he gain?

157. WRITTEN EXERCISES.

40. What per cent of $250 is $15?

$\frac{15}{250}$ (or $15 = $250) = $\frac{3}{50} = \frac{6}{100}$, or 6 %, Ans.

The question is the same as, What is the gain on $1, if there is a gain of $15 on $250.

41. What per cent of $375.42 is $62.57?

$$\begin{array}{r} 375.42)\ 62.570\ (0.16\tfrac{2}{3},\ \text{or}\ 16\tfrac{2}{3}\ \%,\ \text{Ans.} \\ 37\ 542 \\ \hline 25\ 0280 \\ 22\ 5252 \\ \hline 2\ 5028 \end{array} \qquad \frac{2\ 5028}{3\ 7542} = \frac{2}{3}$$

42. What per cent of $56 is $12.88?

43. What per cent of $354 is $198.24?

44. A watch that cost $49 was sold for $45.08. What per cent was lost?

45. A man earns $748 a year and spends $433.84. What per cent does he save?

46. A merchant bought flour at $5 a barrel and sold it for $5.625. What was his per cent of gain?

47. On property valued at $15475 I pay a tax of $247.60. What per cent do I pay?

48. On a bill of $75 only $62.50 was collected. What per cent of the bill remained uncollected?

49. In a school of 504 pupils 14 on an average were absent every day. What was the per cent of attendance?

158. ORAL EXERCISES.

50. $5 is 25% of how many dollars?

Solution. — 25 % means $\frac{25}{100}$. $5 is $\frac{25}{100}$, or $\frac{1}{4}$, of how many dollars? $5 is $\frac{1}{4}$ of 4 times $5, or $20, Ans.

51. $25 is 5 % of how many dollars?

Solution. — $25 is $\frac{5}{100}$ of what? If $25 is $\frac{5}{100}$, $\frac{1}{100}$ is $\frac{1}{5}$ of $25, or $5; and $\frac{100}{100}$ is 100 times $5, or $500, Ans.

52. $5 is 20 % of how many dollars?

53. $20 is 10 % of what sum?

54. $10 is 50 % of what sum?

55. $3 is 12½ % of what sum?

56. A dealer who pays 5 % for selling goods paid one of his salesmen for his day's sales $4. How many dollars worth of goods did the latter sell that day?

57. John bought a knife for 30 cents, spending 25 % of all the money he had. How much did he have left after buying the knife?

58. Arthur spelt correctly only 92 % of the words given to his class, and missed 4 words. How many words were given to the class?

159. WRITTEN EXERCISES.

59. $87.56 is 22 % of what sum of money?

0.22) $87.56 ($398, Ans.
66
215
198
176
176

$87.56 is the product obtained by multiplying the required sum by 0.22; therefore the required sum is $87.56 ÷ 0.22 = $398, Ans.

60. $18.48 is 6 % of what sum?

61. $45.37 is 12½ % of what sum?

62. After paying 20 % of my debts I still owe $485.40. What were my debts at first?

If a man pays 20 %, how many per cent does he still owe?

63. After a loss of 16⅔ % of a flock of sheep 450 remained. How many were there at first?

160. ORAL EXERCISES.

1. What is 3% of $3? of $5? of $8? of $11?

2. If I pay $0.25 for a jack-knife, and sell it for 12% advance, what do I get for it?

3. In a school of 75 pupils, it was reported that 4% were absent. How many were absent?

4. A farmer sold 126 barrels of apples, which was 75% of all he had. How many did he have at first?

5. A farmer having 40 tons of hay fed out 35 tons, what per cent of the whole had he left?

6. If James misspells 5 out of 50 words, what per cent does he misspell?

7. If William pays 25 cents for a knife, and sells it for 20 cents, what per cent does he lose?

8. If John pays 20 cents for a knife, and sells it for 25 cents, what per cent does he gain?

9. If a man pays 10 cents a pound for nuts, and sells for 11 cents, what does he gain per cent?

10. If Charles attends school 87½% of the time, how many days out of 40 is he in school?

11. Which is the more profitable investment, $5 at 4%, or $4 at 5%?

12. If a salesman who gets 5% for selling goods receives for his week's sales $30, how many dollars' worth of goods does he sell during the week?

13. Of 15 hens 5 were sold. What per cent were sold?

14. If a man sells anything for once and a half what it cost him, what per cent does he gain?

15. For how much a yard must I sell prints that cost me 10 cents a yard, in order to gain 25%?

16. Charles spells correctly 85% of the words given to him, and misses 6 words. How many words did he spell correctly?

161. WRITTEN EXERCISES.

17. After a loss of 10% in shrinkage a bin contained 375 bushels of potatoes, how many bushels were there at first?

18. A farmer sold 480 barrels of apples, which was 64% of all he had. How many barrels had he left?

19. If I save $720, or 80%, of my income each year, what is my income?

20. A man drew from the bank $450, which was 15% per cent of all the money he had. How much money had he?

21. If I paid $5575 for a farm, and sold it at a loss of 15%, what did I get for it?

22. What number increased by 23% of itself is 7995?

23. A man bought two horses. For the first he paid $156.25, which was 25% more than the cost of the second. What did the second horse cost?

24. What number lessened 25% of itself is 7250?

25. On a bill of $347.50, only $319.70 was collected. What per cent was lost?

26. After paying 65% of my debts, I still owe $157.50. What were my debts at first?

27. In a school of 468 pupils, 12 on an average were absent every day. What was the per cent of attendance?

28. If I sell a span of horses for $468, and thus lose 22% per cent of the cost, what was the cost?

29. If a coal-dealer buys coal at $6 for the long ton, which is 2240 pounds, and sells at $6 for the short ton, which is 2000 pounds, what per cent does he make?

INTEREST.

162. Mr. Leonard borrowed of me $200, agreeing to pay me for its use for a year 6 % of the $200. How much did he owe me at the end of the year for the use of the $200? Ans. $12.

How much did he owe in all?

Ans. $200 + $12, or $212.

163. **Interest** is money paid for the use of money. In the example above $12 is the *interest* paid for the use of $200 for a year.

164. The **Principal** is the sum for which interest is paid. In the example above $200 is the principal.

165. The **Amount** is the *sum* of the *principal* and *interest*. In the example above $212 is the amount.

166. The **Rate** is the per cent of the principal paid for its use for a year, or for any other specified time. In the example above 6 % is the rate.

NOTE 1. When no time is specified, a year is meant; and when no rate is named, 6 % is understood.

NOTE 2. In computing interest it is the custom to reckon 30 days a month, and 12 months a year.

167. ORAL EXERCISES.

1. What is the interest of $8 at 5 % for 1 year? for 2 years and 3 months?

Solution. — At 5 % the interest of $1 for 1 year is 5 cents; the interest of $8 is 8 times 5 cents = 40 cents, 1st Ans. For 1 year at 5 % the interest of $8 is 40 cents; therefore for 2 years and 3 months, or $2\frac{1}{4}$ years, it is $2\frac{1}{4}$ times 40 cents = 90 cents, 2d Ans.

2. What is the interest of $40 for 1 year at 5 %? at 6 %? at 8 %? at 10 %?

3. What is the interest of $5 for 1 year at 6 %? for 2 years? for 4 years?

4. What is the interest of $25 for 1 year at 4 %? at 5 %? at 10 %?

5. What is the interest of $100 at 6 % for 1 year? for 6 months? for 3 months? for 2 months?

6. What is the interest of $1 at 6 % for 1 year? for 1 month? for 2 months? 3 months? 6 months? 9 months?

7. What is the interest of $1 at 6 % for 6 days? for 1 day? for 12 days? for 18 days?

Solution. — As the interest of $1 for 1 year, or 12 months, is 6 cents, for 1 month the interest is $\frac{1}{12}$ of 6 cents, that is, is 5 mills; and the interest for 6 days is $\frac{6}{30}$, or $\frac{1}{5}$ of 5 mills, that is, is 1 mill; and therefore for one day the interest of $1 is $\frac{1}{6}$ of a mill; for 12 days, 2 mills; and for 18 days, 3 mills.

8. What is the interest of $1 for 1 year at 6 %? at 8 %? at 9 %?

9. What is the interest of $5 for 2 years 6 months at 8 %?

168. WRITTEN EXERCISES.

10. What is the interest of $345 for 2 years 8 months at 6 %?

$345
0.06
$20.70
$2\frac{2}{3}$
41 40
13 80
$55.20, Ans.

The interest of $1 for 1 year at 6 % is $0.06; and the interest of $345 for 1 year is $0.06 × 345 = $345 × 0.06, or $20.70. For 2 years and 8 months, or $2\frac{2}{3}$ years, it must be $2\frac{2}{3}$ times $20.70, or $55.20, Ans.

11. What is the amount of $66.75 for 3 years 6 months at 8 % ?

Principal	$66.75
Interest of $1 for 1 year	0.08
Interest of $66.75 for 1 year . .	$5.3400
	$3\frac{1}{2}$
	1602
	267
Interest of $66.75 for $3\frac{1}{2}$ years .	$18.69
Principal	66.75
Amount	$85.44

12. What is the interest of $53.75 for 2 years at 6 % ?

13. What is the interest of $85.15 for 1 year 4 months at 6 % ? Ans. $6.812.

14. What is the interest of $525 for 2 yr. 9 m. at 8 % ?

15. What is the interest of $632.25 for 3 yr. 6 m. at 10 % ?

16. What is the amount of $127.42 for 2 yr. 2 m. at 9 % ?

169. The method of computing interest given above is applicable to any example in interest. But the method given below is the one generally used by business men, and in most cases is much more expeditious.

To find the interest on any sum of money, at 6 %, for any given time.

170. At 6 %, any sum of money in 2 months, or $\frac{1}{6}$ of a year, will gain 1 %, or 0.01 of itself; and in $\frac{1}{10}$ of 2 months, that is, $\frac{1}{10}$ of 60 days, or 6 days, it will gain $\frac{1}{10}$ of 1 %, or 0.001 of itself.

17. What is the interest of $382 for 3 months 6 days?

Int. of $382 for 2 months	. .	$3.82
" " " 1 month	. :	1.91
" " " 6 days	. .	0.382
" " " 3 m. 6 d.	. .	$6.112, Ans.

For two months we take $\frac{1}{100}$ of the principal, or $3.82; for 1 month $\frac{1}{2}$ of $3.82; and for 6 days $\frac{1}{1000}$ of the principal, or $0.382. The sum of these, or $6.112, is the interest of $382 for 3 months and 6 days.

18. What is the interest of $218 for 1 month 3 days?

Int. of $218 for 2 months		$2.18
" " " 1 month		$1.09
" " " 3 days ($\frac{1}{10}$ of 1 m.)	.	0.109
" " " 1 m. 3 d.		$1.199, Ans.

19. What is the interest of $846 for 9 months 9 days?

Int. of $846 for 2 months	. . .	$8.46
" " " 8 "	. . .	$33.84
" " " 1 "	. . .	4.23
" " " 6 days	. . .	0.846
" " " 3 "	. . .	0.423
" " " 9 m. 9 d.	. . .	$39.339, Ans.

20. What is the interest of $56 for 2 months 15 days?

Int. of $56 for 2 months		$0.56
" " " 15 days ($\frac{1}{4}$ of 2 m.) .		0.14
" " " 2 m. 15 d.		$0.70, Ans.

21. What is the interest of $675 for 22 days?

Int. of $675 for 60 days (2 m.) . .		$6.75
" " " 20 " ($\frac{1}{3}$ of 60 d.) .		$2.25
" " " 2 "		0.225
" " " 22 "		$2.475, Ans.

22. What is the interest of $846.40 for 1 year 3 months 25 days?

Int. of $846.40 for 2 m.	$8.464;	for 6 d., $0.8464
" " " 14 months . .		$59.248
" " " 1 " . .		4.232
" " " 24 days (4 × 6 d.)		3.3856
" " " 1 " . . .		0.1411—
" " " 1 y. 3 m. 25 d. .		$67.0067—, Ans.

171. Hence, to compute interest at 6 % for any given time,

Rule.

Move the decimal point in the principal two places to the left, and the result will be the interest for two months, or sixty days. Move the point three places to the left, and the result will be the interest for six days. Then take such multiples and parts of these results as the given time requires; the sum of these will be the interest.

To find the amount,

Add the interest to the principal.

23. What is the interest of $316 for 9 m.?
Ans. $14.22
24. What is the interest of $186 for 3 m. 13 d.?
Ans. $3.193
25. What is the interest of $54 for 1 m. 26 d.?
26. What is the interest of $396 for 3 m. 24 d.?
27. What is the interest of $48.54 for 7 m. 27 d.?
28. What is the interest of $184 for 9 m. 20 d.?
29. What is the interest of $225 for 1 y. 8 m.?
30. What is the interest of $540 for 3 m. 15 d.?

31. What is the amount of $248 for 5 m. 20 d.?

Principal	$248
Interest for 4 months . . .	4.96
" 1 month	1.24
" 20 days ($\frac{1}{3}$ of 2 m.) .	0.827—
Amount for 5 m. 20 d. . . .	$255.027—, Ans.

NOTE. The interest of $248 for 20 days is $0.826⅔, and we write $0.827—. In paying the amount in this example $255.03 would be paid.

In business transactions mills in the *result* are omitted; but if they are more than 5, the cents are increased by 1.

32. What is the amount of $65 for 4 m. 15 d.?
33. What is the amount of $18.20 for 7 m. 25 d.?
34. What is the interest of $378.50 for 8 m. 13 d.?
35. What is the amount of $635.40 for 9 m. 9 d.?
36. What is the interest of $2580 for 2 y. 2 m. 2 d.?
37. What is the interest of $1475.75 for 3 m. 3 d.?
38. What is the amount of $7584 for 1 yr. 2 m. 22 d.?

39. What is the interest of $83.45 from Mar. 28 to Aug. 17?

From March 28 to July 28 is 4 months; from July 28 to July 31 is 3 days; and from July 31 to Aug. 17 is 17 days. Hence, from March 28 to Aug. 17 is 4 months 20 days.

40. What is the interest of $1844 from Sept. 20 to Dec. 8?

(Time, 2 months 18 days.)

41. What is the interest of $49.33 for 11 m. 29 d.?

42. What is the amount of $555 from April 5 to Oct. 24?

43. What is the interest of $7856 for 1 yr. 1 m. 1 d.?

44. What is the interest of $42.88 from May 5 to Dec. 25?

45. What is the amount of $128.95 from Nov. 15, 1894, to Feb. 3, 1895?

46. What is the amount of $56 for 9 m. 15 d.?

172. To find the interest of any sum for any time at any other rate than 6 %.

Interest at 1 % is $\frac{1}{6}$ of the interest at 6 %; at 2 %, $\frac{1}{3}$; at 3 %, $\frac{1}{2}$; at 4 %, 6 % $-\frac{1}{3}$ of 6 %; at 5 %, 6 % $-\frac{1}{6}$ of 6 %; at 7 %, 6 % $+\frac{1}{6}$ of 6 %; at 8 %, 6 % $+\frac{1}{3}$ of 6 %; at 9 %, 6 % $+\frac{1}{2}$ of 6 %; etc.

47. What is the interest of $84.25 for 6 m. 13 d. at 8 %?

Int. of $84.25	for	6 m.	at 6 % . .		$2.5275
" "	"	12 d.	" " . .		0.1685
" "	"	1 d.	" " . .		0.014
" "	"	6 m. 13 d.	" " . .		$2.71
" "	"	"	" 2 % . .		0.90
" "	"	"	" 8 % . .		$3.61, Ans.

48. What is the amount of $27 for 3 m. 12 d. at 5 % ?

Interest of $27 for	2 m.	at	6 % .		$0.27
" " "	1 m.	"	" .		0.135
" " "	12 d.	"	" .		0.054
" " "	3 m. 12 d.	"	" .		$0.459
" " "	"	"	1 % .		0.076
" " "	"	"	5 % .		$0.383
Principal					$27
Amount of $27 for 3 m. 12 d. at 5 % .					$27.383, Ans.

49. What is the interest of $99 for 9 m. 9 d. at 9 % ?

50. What is the interest of $150 for 4 m. 23 d. at 10 % ?

51. What is the amount of $375 from Dec. 18, 1893, to July 7, 1894, at 4 % ?

52. What is the interest of $750 from March 13 to Aug. 9 at 3 % ?

53. What is the interest of $222 for 5 m. 18 d. at 7 % ?

54. What is the amount of $7540 from Sept. 4, 1894, to March 12, 1895, at 8 % ?

55. What is the interest of $83 from Oct. 19, 1894, to July 25, 1895, at 5 % ?

56. What is the interest of $450 from April 20 to Sept. 1 at 9 % ?

57. What is the amount of $5840 for 2 yr. 25 d. at 7 % ?

58. What is the interest of $78.14 from July 21 to Oct. 7 at 5 % ?

59. What is the amount of $187.50 from Sept. 17, 1894, to March 8, 1895, at 4 % ?

squares; that is, its area = (5 × 3) square inches = 15 square inches. Therefore,

The area of a rectangle is the product of its base and altitude.

173. BUSINESS FORMS.

Order for Goods.

Newburyport, Aug. 25, 1894.

Messrs. Chas. Clarke & Co.

Gentlemen: Pay Wallace Colcord, or order, seventy-five dollars ($75) in goods, and charge to the account of

George Everett.

Bank Check.

65\frac{25}{100}$ *Cambridge, Mass., July 9, 1895.*

Charles River National Bank.

Pay to the order of Robert Copeland sixty-five $\frac{25}{100}$ *dollars.*

No. 473. *Thomas McGill.*

Receipt for Money on Account.

$150. *Springfield, Sept. 17, 1895.*

Rec'd from George Battelle one hundred fifty dollars on account.

Frederic F. Wight.

Receipt in full of all Demands.

$375.75. Lowell, Oct. 7, 1895.

Rec'd from Frank C. Paine three hundred seventy-five and $\frac{75}{100}$ dollars in full of all demands.

George L. Howe.

Order for Money.

Worcester, Sept. 23, 1895.

John Shumway & Co.

Pay Horace Harwood, or order, fifteen dollars ($15), and charge to our account.

Guild & Co.

Note on Time.

$350. Boston, Sept. 21, 1895.

Three months after date, we promise to pay to the order of Newton & Hall three hundred fifty dollars.

Value received.

Howe & Richardson.

Note payable on Demand.

$275.56. Lynn, Aug. 27, 1895.

On demand, I promise to pay Charles H. Mason, or order, two hundred seventy-five dollars and fifty-six cents, with interest at 7%.

Value received. George M. Smith

174. MISCELLANEOUS ORAL EXERCISES.

1. If 5 pounds of sugar cost \$0.50, what will 8 pounds cost?

2. If 4 men can do a piece of work in 5 days, how long will it take 5 men to do the work?

3. If I buy oranges at the rate of 4 for 5 cents, and sell 3 for 6 cents, how much do I gain on a dozen?

4. How many dozen eggs at 18 cents a dozen must be given for 8 pounds of sugar at 9 cents a pound?

5. How many lemons at 4 for 7 cents, can you buy for 35 cents?

6. How many pounds of ham at $12\frac{1}{2}$ cents a pound can be bought for \$3?

7. If a man sells a watch for $\frac{7}{8}$ of its cost, receiving \$32, what did it cost?

8. Bought 100 pounds of tea for \$50. What must I sell it for a pound to make 20%?

9. John bought a pound of raisins for 13 cents, 3 pounds of sugar at 9 cents a pound, and 3 sticks of candy for 3 cents. He pays for them with a fifty-cent piece. How much change should he receive?

10. At 64 cents a gallon, what will 3 quarts of molasses cost?

11. If $\frac{2}{5}$ of a barrel of flour cost \$$2\frac{1}{2}$, how many barrels can be bought for \$54?

12. What date is it 15 days after Feb. 24, 1895?

13. If a man sells broadcloth for \$2.20 a yard, and gains 10%, what per cent would he gain if he sold for \$2.50 a yard?

14. How many hours are there from 4.15 P.M. to-day to 11.45 A.M. to-morrow?

15. What will 1 pound and 7 ounces of butter cost, at \$0.32 a pound?

16. What per cent of anything is $\frac{3}{5}$ of it? $\frac{3}{8}$ of it?

17. What will 28 eggs cost at 24 cents a dozen?

18. If you buy 3 pounds of raisins at 11 cents a pound, 4 pounds of soap at 9 cents a pound, and a dozen oranges at 20 cents a dozen, and give the storekeeper a one-dollar bill, how much change should you receive?

19. If 8 men, or 16 boys, can do a piece of work in 10 days, how long will it take 8 men and 16 boys to do the work?

20. James bought a penknife and a bat for $0.48. The bat cost $\frac{2}{5}$ as much as the penknife. What was the cost of each?

21. If the price of land rises from $0.20 a square foot to $0.25, what is the per cent of rise?

22. If the price of land falls from $0.25 a square foot to $0.20, what is the per cent of fall?

23. If a quantity of provision will last 6 men 10 days, how long will it last 5 men?

24. If 1 orange is worth 2 pears, and 8 pears are worth 3 lemons, how many pears must you give for 10 oranges and 12 lemons?

25. If a boy misspells 8 out of 40 words, what per cent does he misspell? What would his rank-mark be on a scale of 10? on a scale of 8?

26. How long will it take a sum of money to double itself, at 1 % interest? at 5 %? at 6 %? at 10 %?

27. If A can do a piece of work in 2 days and B in 3 days, how many days will it take A and B together to do the work?

28. If a pole 4 feet long casts a shadow 5 feet long, how long is the pole whose shadow at the same time is 20 feet long?

29. At $0.48 a pound, what must be paid for 9 ounces of tea?

30. A piece of work must be done in 5 days, and it will take 4 men 10 days to do it. How many men must be put upon the work?

31. If in a school of 450 pupils 96 % were present on Friday, how many pupils were absent?

32. What is 20 % of $5? 25 %? 33⅓ %? 40 %?

33. How many feet are there in 9¼ yards?

34. ½ − ⅓ = ? ⅓ − ¼ = ? ¼ − ⅕ = ? ⅕ − ⅙ = ?

35. How many times is ½ contained in ⅔?

36. What is the interest of $5 for 2 years 4 months, at 6 %?

37. What per cent of $30 is $3? $5? $6? $10?

38. If I pay my agent $10 for collecting $400, what per cent do I pay him?

39. A merchant owning ⅞ of a ship sold ⅔ of his share for $5000. What was the value of the ship?

40. If by selling sugar at 4 cents a pound I lose 20 %, what per cent should I gain if I sold it at 5½ cents a pound?

41. A boy spent $0.20, which was 33⅓ % of all he had. How much money did he have?

42. What is the difference between 8 rods square and 8 square rods?

43. In an orchard ⅓ of the trees are pear-trees, ¼ are cherry-trees, and the rest, 50 trees, are apple-trees. How many trees are there in the orchard?

44. If a horse is sold for $175, and the gain is 25 %, what was the cost of the horse?

45. A man and his wife together used a barrel of flour in 5 months, but one lasted the woman alone 11 months. How long would a barrel of flour last the man alone?

46. What is the amount of $8 for 3 years 10 months, at 6 %?

47. What date is 16 days after August 23?

175. MISCELLANEOUS WRITTEN EXERCISES.

48. Reduce $\frac{2}{3}$ of $\frac{6}{64}$ of $\frac{3.}{5\frac{1}{4}}$ to a decimal.

49. If $\frac{3}{8}$ of an acre of land costs $3750, what will $12\frac{1}{2}$ acres cost?

50. If A can do a piece of work in 6 days, B in 8, and C in 10, how long will it take the three together to do the work?

51. A note of $225, dated Jan. 9, 1893, was paid Aug. 7, 1895, with interest at 6%. Find the amount paid.

52. Find the number of square yards in the ceiling and walls of a room 18 feet long, 12 feet wide, and 9 feet high.

53. How many feet are there in $\frac{4}{5}$ of a mile?

54. Divide the difference between 7 thousand and 7 thousandths by 7 hundredths.

55. A coal-dealer who had 625 tons of coal, sold 84% of it. How many tons has he left?

56. The sum of two numbers is $257\frac{1}{2}$, and their difference is $84\frac{1}{4}$. What are the numbers?

57. Change $\frac{3}{4}$, $\frac{2}{5}$, $\frac{1}{16}$, $\frac{5}{8}$, $\frac{3}{25}$ to decimals, and find their sum.

58. Find the interest of $75.45 from Jan. 19, 1894, to March 14, 1895.

59. Find the number of feet board measure in 25 joists, each 18 feet long, 4 inches wide, and 3 inches thick.

60. If I pay $1250 for a house, and sell it so as to gain 15%, what do I get for it?

61. If 21 barrels of flour cost $115.50, what will 36 barrels cost?

62. I lost 30% by selling a suit of clothes for $35. What did the suit cost me?

63. What per cent of an acre is a square rod?

64. A gentleman bequeathed $\frac{1}{2}$ of his estate to his wife, $\frac{2}{3}$ of the remainder to his eldest son, and the rest to his daughter, who received $876.50. What was the value of the whole estate?

65. A collector of the taxes of a town retained for collecting $2\frac{1}{2}\%$, which was $844. How much does the town receive?

66. The fore wheel of a carriage is 9 feet in circumference, and the hind wheel 11 feet. How many times will each turn round in going from Boston to Fitchburg, 43 miles?

67. If a town of 1345 inhabitants increases to 1495, what will be its gain per cent?

68. What will a building lot containing $\frac{1}{3}$ of an acre cost, at $0.12\frac{1}{2}$ a square foot?

69. If I sell $\frac{3}{8}$ of a lot of goods for what $\frac{1}{2}$ the lot cost, what is the gain per cent?

70. If I sell a share of stock for $97.50, and gain 5%, what did the share cost me?

71. Find the amount of $45.50 at 6% for 2 yr. 9 m. 8 d.

72. What will it cost to pave a hall 25 feet long and 8 feet wide, with marble slabs 10 inches long and 8 inches wide, at $18 a dozen?

73. If I sell 300 bales of cotton, each weighing 430 pounds, at 8 cents a pound, and retain $2\frac{1}{2}\%$ for selling, how much ought I to remit to my employer?

74. Sold 2 horses for $275 each, losing 20% on one, and gaining 20% on the other. Do I gain or lose on both, and how much?

75. If in a year of 365 days 55 are stormy, what per cent of the weather is stormy?

76. Find the amount of $345.38 at 5% from Oct. 25, 1894, to March 13, 1895.

77. A merchant cleared $5 by selling at the rate of 5 for 9 cents, eggs which he bought at the rate of 5 for 8 cents. How many eggs did he sell?

78. A man paints both sides of a fence 5 feet high in $4\frac{5}{6}$ days, working 10 hours a day. If he paints 6 square yards an hour, how long is the fence?

79. How much must I pay for $8\frac{3}{16}$ cords of wood at the rate of $\$14\frac{1}{4}$ for 3 cords?

80. How many cubic yards of earth must be thrown out to dig a ditch 3 feet deep and 2 feet wide, just outside the boundary of a square lot of land 15 rods long and 12 rods wide?

81. What is the interest of $77.45 for 5 m. 4 d.?

82. I gained $15 by selling my carriage at an advance of 12 % on the cost. What did it cost?

83. If 12 men, working 10 hours a day, can build a certain wall in 8 days, how many days will it take 15 men to build the wall by working 9 hours a day?

84. Find the amount at 7 % per cent of $75.45 from Sept. 5, 1894, to Jan. 15, 1895.

85. A rectangular lot of land, 60 ft. by 120 ft., is worth $0.22 a square foot. How much will it cost to purchase the lot and fence it, if the fence costs $12\frac{1}{2}$ cents a linear foot?

86. How many days must a man who earns $1.75 a day, and spends $0.90, work to save $510?

Find the amount at 6 % of

87. $420.55 for 5 m. 6 d.; for 6 m. 5 d.

88. $17.18 for 3 m. 10 d.; for 5 m. 3 d.

89. $84.25 for 7 m. 8 d.; for 5 m. 2 d.

90. $523 for 8 m. 13 d.; for 2 m. 25 d.

91. $25.33 for 6 m. 18 d.; for 3 m. 11 d.

92. $137 for 9 m. 20 d.; for 4 m. 27 d.

93. $64.10 for 10 m. 25 d.; for 8 m. 7 d.

94. $123.15 for 11 m. 11 d.; for 7 m. 7 d.

95. Mr. Burns sold his carriage for $224, which was $\frac{8}{7}$ of its cost. What would he have gained if he had sold it for $210?

96. A farmer bought through an agent 6 cows, and sent $525.30 to pay for the cows and a commission of $2.50 for each. What did each cow cost?

97. Mr. Hovey bought 28500 pounds of hay at $12\frac{1}{2}$ a ton, and sold it at $0.87\frac{1}{2}$ a hundred weight. What was the gain?

98. A man sold 65 bushels of wheat for $59.80, gaining $7.80. What did the wheat cost him a bushel?

99. A coal dealer bought 350 tons of coal, each ton weighing 2240 pounds, at $4.25 a ton. He sold it in tons of 2000 pounds at $5.00 a ton. What was his entire profit?

100. If my agent collects 80 % of a debt of $4500, and charges $7\frac{1}{2}$ % commission, what amount should he pay me?

101. Change $\frac{9}{25}$ and $\frac{13}{65}$ to decimals, and find their sum.

102. Divide six hundredths by two ten-thousandths, and multiply the quotient by four millionths.

103. If 20.5 bushels of wheat cost $12.71, what will $7\frac{1}{2}$ bushels cost?

104. Find the exact difference of time from June 18, 5 P. M., to Sept. 10, 8.30 A. M.

105. Find the interest of $85.44 at 6 % for 3 y. 7 m. 8 d.

106. Find the amount of $183.58 from Jan. 19, 1894, to May 7, 1896, at 5 %.

107. Two men sold each his horse for $163.80. One gained 30 %, and the other lost 30 %. What did each pay for his horse?

108. What fraction multiplied by $\frac{4}{5}$ gives $\frac{2}{3}$?

109. Express $\frac{2}{14}$ % as a common fraction. $\frac{7}{100}$ %.

110. Reduce $\frac{7458}{12852}$ to its lowest terms.

111. Find the exact time from Jan. 17, 1895, 5 A. M., to May 6, 1896, 8.30 P. M.

112. Find the date 131 days 5 hours from June 29, 1895, 9.30 P. M.

113. Multiply 5 rd. 1 yd. 2 ft. by $10\frac{1}{2}$.

114. A circular track measures 48 rd. 2 yd. 2 ft. How many times must one run round this track to go 5 miles?

115. Divide 546 into two such parts that the first shall be $\frac{11}{17}$ of the second.

116. What will it cost, at \$0.40 a square yard, to plaster the walls and ceiling of a room 18 ft. long, 12 ft. wide, and 9 ft. high, if the mop-board is a foot wide, and 75 square feet are deducted for doors and windows.

117. How many cords of wood are there in a pile 65 ft. long, $5\frac{1}{2}$ ft. high, and 4 ft. wide?

118. My neighbor has a lot of land 9 rods square, and I have a lot containing 9 square rods. Find the difference in area of these lots in square feet.

119. Mr. Newton paid the cash for 672 yards of cloth at \$1.25 a yard, and sold it for \$1.50 a yard. What did he gain?

120. Mr. Morse bought 115 yards of cloth for \$375. For cash he had a discount of \$30. What must he get a yard, to gain \$23 on his purchase?

121. Miss Swan bought a bicycle billed at \$98. On this there was first made a discount of $\frac{1}{5}$ of the price; then on the balance a farther discount of $\frac{1}{20}$. What did Miss Swan pay for her bicycle?

122. How many feet, board measure, are there in a stick of timber 16 feet long and 6 by 8 inches in the other dimensions?

123. How many feet, board measure, are there in 15 joists, each 14 feet long and 3 inches by $4\frac{1}{2}$ inches in the other dimensions.

124. What must be paid for sawing a pile of wood 20 feet long, 4 feet wide, and 6 feet high, at \$1.20 a cord?

125. How many feet, board measure, are there in 15 boards each 13 feet long, 15 inches wide, and $\frac{3}{4}$ inch thick?

126. How many house lots, each containing $2\frac{5}{8}$ acres, can be made from a field containing $199\frac{1}{2}$ acres?

127. If 576 barrels of flour cost \$2822.40, what will 964 barrels cost?

128. What date was it 87 days 14 hours before Sept. 16, 9 A. M.?

129. Find the cost of 36 rolls of paper at \$0.75 a roll, 37 yards of straw matting at \$0.25 a yard, 43 yards of carpet at \$1.17 a yard, 6 window shades at \$0.85 each, 8 chairs at \$0.87 each, and 3 days' work at \$2.75 a day.

130. How many square feet are there on the surface of a box 24 inches long, 15 inches wide, and 10 inches high?

131. How much will it cost, at \$0.87$\frac{1}{2}$ a foot, to fence a rectangular piece of land 15 rods long and 8 rods wide?

132. $84.6 \times 100 \div 10\,000 = ?$

133. $(84.6 \div 10\,000) \times 100 = ?$

134. From a field of 176.35 acres $90\frac{7}{8}$ acres were sold to one person and $\frac{3}{25}$ of an acre to another. How much was left?

135. If I buy 150 head of cattle at the rate of \$42.50 a head, and 300 sheep at the rate of \$4.50 a head, and sell the lot for \$10 300, what do I gain?

136. A man drew from a bank $54.60, which was 15 % of his deposit. What did he have left on deposit?

137. If a man can walk 19 miles in $5\frac{1}{6}$ hours, how far can he walk in $7\frac{2}{3}$ hours?

138. What is the interest of $960 for 1 year, 3 months, 6 days, at 6 %?

139. What is the amount of $1185 for 3 years, 7 months, 12 days, at 5 %?

140. A man sold a span of horses for $330, which was $\frac{22}{19}$ of their cost. What did he gain?

141. When potatoes are worth $\$\frac{4}{9}$ a bushel, and corn $\$\frac{5}{8}$ a bushel, how many bushels of potatoes ought to be given for 16 bushels of corn?

142. What will $\frac{7}{11}$ of a cord of wood cost, if $\frac{5}{9}$ costs $3.85?

143. One fourth of my money is in my pocket, $\frac{2}{5}$ in the bank, and the rest, or $888, is in real estate. How much is in my pocket, and how much in the bank?

144. A commission merchant had sent to him 4600 quarts of berries. He sold $\frac{1}{4}$ of them at $11\frac{1}{4}$ cts. a quart; $\frac{2}{5}$ at $10\frac{1}{2}$ cts. a quart; $\frac{3}{10}$ at $9\frac{1}{4}$ cts. a quart; and the rest at 8 cts. a quart. How much did he receive for the lot?

145. A clerk's income is $800 a year, and he pays 22 % of it for board, and 45 % of the remainder for his other expenses. How much does he save a year?

146. An auctioneer sold for Mrs. Peters, on 10 % commission, 14 chairs at $1.50 each; 7 tables at $2.45 each; 35 yards of carpet at $0.55 a yard; and a miscellaneous lot for $75.44. What sum did Mrs. Peters receive?

147. What is the amount of $35.18 for 3 y. 3 m. 3 d. at 6 %?

WRITTEN EXAMPLES FOR REVIEW.

Arranged by Topics.

Addition and Subtraction.

1. What is the sum of five hundred six, four hundred ten, eight hundred fifteen, six hundred twenty, five thousand forty, eight thousand two hundred nine, and thirty thousand four hundred six?

2. Mr. James bought articles as follows: sugar, $0.75; salt, $0.18; flour, $1.25; fish, $0.32; raisins, $0.45; canned salmon, $1.33; spices, $0.38. He handed the clerk a $5 bill, and received in change a 25-cent piece, a 5-cent piece, and 4 cents. Was the change right?

3. Mason Hill owes one man $21.54, another $85.17, another $117.39, and a fourth $78.16. How much does he owe these four men?

4. A merchant sold goods to the amount of $18.37 on Monday, $12.55 on Tuesday, $21.15 on Wednesday, $17.77 on Thursday, $19.24 on Friday, and $32.05 on Saturday. Find the amount of sales for the week.

5. James Nash bought a suit of clothes for $35.50, an overcoat for $17.25, a pair of shoes for $3.75, a hat for $3.50, and a pair of gloves for $1.75. How much was his bill?

6. Find the sum of eight hundred four, 716, five thousand thirty, 223, seven hundred one, 645, and nine thousand two.

7. Add 530, fourteen thousand seven, eight hundred thousand seventeen, 64 321, 7 647, twelve thousand sixty, and forty thousand eight.

8. The digging of the cellar of a house cost $53; the stone and the laying of the stone for the cellar, $225; the stone trimming, $337; the brick and the mason's work, $1876; the window-frames and the windows, $371; the door-frames and doors, $275; the lumber for frame, etc., $508; the carpenter's work, $2374; and the plumbing, furnace, electric appliances, gas-pipes, slating, etc., $1318. What did the house cost?

9. Mr. Raymond received for his week's work $24.25. Out of this he paid for groceries, $4.17; for street-car fares, $0.60; for paper, pens, and ink, $0.55; for a pair of gloves, $0.85; for postage, $0.25; for his daily paper, $0.12; for medicine, $1.45; for dinners, $2.40. How much did he have left of his week's wages?

10. A, B, and C formed a partnership with a paid in capital of $6000. A put in $2365 and B $1753, and C the rest. How much did C put in?

11. Mr. Allen had on deposit $3475. He bought a lot of land for $789, and paid for plans for a house $125. How much did he have left of his deposit with which to build the house?

12. Richard Hill bought articles at a meat-stall as follows: beef, $2.25; turkey, $1.76; fowls, $0.93; lamb, $1.12. How much change should he receive, if he passes in to pay for it a $5 bill and 3 half-dollars?

Add the following:

(13)	(14)	(15)
8643	76431	53781
4792	35672	72562
5173	68721	64235
7628	43876	34578

(16)	(17)	(18)
87643	25349	43781
56782	91278	12436
35861	79432	75658
67649	28125	56127
76378	54871	37845

(19)	(20)	(21)
$131.05	$117.08	$204.90
17.41	97.41	87.13
11.79	72.35	29.44
87.35	17.44	75.10
108.10	183.10	18.23
94.17	14.15	34.72

(22)	(23)	(24)
$343.10	$533.18	$878.19
187.15	417.06	216.04
206.05	829.31	678.93
641.23	273.24	571.25
871.14	416.79	325.83
642.83	543.78	612.91
513.64	776.18	425.67

(25)	(26)	(27)
$217.16	$346.25	$763.02
612.43	725.13	851.14
735.18	632.71	178.23
543.57	549.37	765.43
397.62	478.26	568.12
452.73	391.16	271.93
861.04	543.27	812.64
178.65	678.32	327.85

Multiplication and Division.

28. A man having a journey of 337 miles to perform in 6 days, travels 63 miles a day for 5 days; how far must he go on the sixth day?

29. The factors of one number are 29 and 43, and of another 13 and 41; what is the difference of the two numbers?

30. A steamboat makes 275 trips in one season; she carries an average of 200 passengers each trip, and 85 tons of merchandize. If the average receipts are $3 for each passenger and $1 for each ton of freight, how much money does she receive?

31. A money-drawer contains 15 five-dollar bills, 18 two-dollar bills, 27 dollar bills, 26 half-dollars, 12 quarters, 54 ten-cent pieces, 38 five-cent pieces, and 47 cents. How much money does the drawer contain?

32. It is stated that for every seal taken two others are killed. If, then, 62817 are taken in a season, by how many is the total number of seals lessened?

33. How long will it take four men to count $18 000 000, if each man counts $120 000 a day?

34. A farmer sells to a merchant 15 bushels of corn at $0.65 a bushel, 45 bushels of potatoes at $0.70 a bushel, 15 dozen of eggs at $0.25 a dozen. In payment he takes from the merchant 5 yards of cloth at $0.25 a yard, 2 barrels of flour at $5.25 a barrel, and 3 pounds of coffee at $0.38 a pound. Make out the bill showing the balance due.

35. James Yerxa sold F. J. Pierce 10 pounds of coffee at $0.27 a pound, 25 pounds of sugar at $0.06 a pound, and a box of raisins for $1.17. Make out a receipted bill for Mr. Pierce.

Find the cost of

36. 45 bushels of oats at $0.45 a bushel
37. 85 pounds of ham at $0.11 a pound.
38. 95 pounds of soap at $0.04 a pound.
39. 125 bushels of beans at $2.05 a bushel.
40. 116 barrels of flour at $5.25 a barrel.
41. 75 pounds of raisins at $0.07 a pound.
42. 125 dozen of eggs at $0.33 a dozen.
43. 143 pounds of butter at $0.27 a pound.
44. 250 pounds of macaroni at $0.12 a pound.
45. 175 pounds of prunes at $0.13 a pound.
46. 57 bushels of corn at $0.67 a bushel.
47. 118 pounds of coffee at $0.35 a pound.
48. 48 barrels of lime at $1.28 a barrel.
49. 73 baskets of peaches at $0.73 a basket.
50. 87 barrels of apples at $2.25 a barrel.
51. 43 boxes of strawberries at $0.14 a box.
52. 28 tons of coal at $5.75 a ton.
53. 37 cords of wood at $6.35 a cord.
54. 49 tons of hay at $15.25 a ton.
55. 147 bushels of potatoes at $0.55 a bushel.
56. 55 pounds of tea at $0.44 a pound.
57. 38 yards of muslin at $0.15 a yard.
58. 51 pieces of ribbon at $0.35 a piece.
59. 85 rolls of paper at $1.25 a roll.
60. 57 yards of carpet at $1.75 a yard.
61. 48 pairs of gloves at $0.63 a pair.
62. 37 pairs of hose at $0.27 a pair.
63. 43 yards of silk at $2.25 a yard.
64. 18 reams of paper at $1.87 a ream.
65. 85 acres of land at $53 an acre.
66. 43 sheep at $2.17 a head.
67. 56 dictionaries at $1.17 a copy.
68. 75 grammars at $0.42 a copy.
69. 116 algebras at $0.95 a copy.

70. Divide $15.13 equally among 17 boys.

71. The product of two numbers is 89386, and one of the numbers is 478. What is the other number?

72. For 83 cords of wood James Man paid $539.50. How much did he pay a cord?

73. If a pipe discharge 73 gallons an hour, how many hours will it take the pipe to empty a cistern containing 6132 gallons?

74. What number multiplied by five hundred four will give one hundred fifty-seven thousand two hundred forty-eight?

75. How many cords of wood at $6.50 a cord must be given for 13 tons of coal at $5.50 a ton?

76. Product = 91182; multiplicand = 6513. Multiplier = ?

77. If I pay $8.55 for 45 yards of cloth, how much do I pay a yard?

78. John Moore walked 572 miles at the rate of 22 miles a day. How many days did it take?

79. How many pounds of butter at $0.27 a pound must be given for 16 pounds of sugar at $0.06, 2 pounds of tea at $0.38 a pound, and a barrel of flour at $5.57?

80 The area of Texas is 265780 square miles, and of Connecticut 4990. How many States as large as Connecticut can be cut out of Texas?

81. A man earns $1875 a year, and each of his two sons $517. The father spends $1114 a year and each of the sons $315. How much will the three save in 4 years?

82. A grocer bought for his trade 4 chests of tea, each containing 20 pounds, at $0.25 a pound, 5 bags of prunes, each containing 25 pounds, at $0.09 a pound, and 16 boxes of soap, each containing 75 pounds, at $0.04½ a pound. Make out his bill.

Find the price of one pound, 1 dozen, etc.

83. If 317 pounds of butter cost $79.25.
84. If 65 pounds of coffee cost $24.70.
85. If 48 dozen of eggs cost $14.88.
86. If 17 yards of silk cost $29.75.
87. If 21 yards of lace cost $8.61.
88. If 85 cords of wood cost $467.50.
89. If 38 pounds of sugar cost $2.09.
90. If 57 rolls of paper cost $42.75.
91. If 13 quarts of maple syrup cost $4.29.
92. If 45 baskets of peaches cost $28.35.
93. If 53 barrels of flour cost $291.50.
94. If 37 yards of cloth cost $27.75.
95. If 125 pounds of nuts cost $15.
96. If 34 yards of flannel cost $22.10.
97. If 27 reams of note-paper cost $29.70.
98. If 24 reams of letter-paper cost $33.60.
99. If 158 pounds of soap cost $7.11.
100. If 18 pairs of hose cost $6.30.
101. If 32 pairs of gloves cost $43.84.
102. If 43 bushels of oats cost $19.35.
103. If 116 pounds of raisins cost $8.70.
104. If 170 pounds of tea cost $57.80.
105. If 225 pounds of prunes cost $24.75.
106. If 82 pounds of cheese cost $10.25.
107. If 150 pounds of macaroni cost $18.75.
108. If 19 yards of velvet cost $12.35
109. If 73 acres of land cost $3139.
110. If 57 sheep cost $133.
111. If 39 tons of hay cost $604.50.
112. If 17 cows cost $629.
113. If 29 tons of coal cost $181.25.
114. If 15 horses cost $1018.50.
115. If 377 arithmetics cost $282.75.
116. If 183 histories cost $122.61.

Fractions.

117. Reduce to its lowest terms $\frac{1170}{9648}$.

118. Reduce to its lowest terms $\frac{550}{7000}$.

119. Reduce to improper fractions $76\frac{51}{75}$; $272\frac{1}{4}$.

120. Reduce to mixed numbers $\frac{1964}{7}$; $\frac{34867}{19}$.

121. Reduce $\frac{3}{5}$, $\frac{2}{9}$, $\frac{4}{10}$ to fractions having their least common denominator.

122. Reduce $\frac{4}{7}$, $\frac{7}{8}$, $\frac{3}{14}$, $\frac{5}{16}$ to fractions having their least common denominator.

123. Find the sum of $8\frac{1}{4}$, $17\frac{3}{8}$, $25\frac{1}{8}$, and $37\frac{2}{9}$.

124. From $75\frac{2}{5}$ take $34\frac{2}{3}$.

125. $\frac{3}{7} + \frac{4}{5} + \frac{5}{10} = ?$

126. $\frac{2}{7} + \frac{1}{3} + \frac{5}{21} = ?$

127. $\frac{7}{8} + \frac{1}{4} + \frac{5}{16} = ?$

128. $\frac{4}{5} + \frac{2}{3} + \frac{7}{10} = ?$

129. $\frac{2}{5} + \frac{1}{3} + \frac{3}{4} = ?$

130. $\frac{3}{8} + \frac{5}{12} + \frac{1}{6} = ?$

131. $\frac{3}{9} + \frac{2}{3} + \frac{4}{15} = ?$

132. $\frac{6}{7} + \frac{3}{5} + \frac{1}{10} = ?$

133. Add $38\frac{1}{3}$, $74\frac{2}{5}$, and $13\frac{1}{4}$ together.

134. $17\frac{1}{5} + 7\frac{1}{4} + 13\frac{5}{10} = ?$

135. $85\frac{5}{6} + 19\frac{5}{12} + 27\frac{3}{4} = ?$

136. $43\frac{2}{3} + 18\frac{5}{9} + 15\frac{1}{6} = ?$

137. From $\frac{2}{5}$ take $\frac{3}{17}$. From $\frac{3}{7}$ take $\frac{5}{18}$.

138. $\frac{8}{15} - \frac{5}{18} = ?$

139. $\frac{7}{12} - \frac{5}{18} = ?$

140. $\frac{23}{36} - \frac{11}{35} = ?$

141. $277\frac{1}{5} - 118\frac{3}{4} = ?$

142. $344\frac{2}{3} - 277\frac{1}{5} = ?$

143. $255\frac{5}{6} - 149\frac{3}{5} = ?$

144. $\frac{8}{11} - \frac{4}{7} = ?$

145. $\frac{7}{21} - \frac{6}{24} = ?$

146. $\frac{21}{21} - \frac{5}{10} = ?$

147. $347\frac{1}{5} - 87\frac{2}{3} = ?$

148. $489\frac{2}{7} - 35\frac{1}{3} = ?$

149. $784\frac{5}{8} - 198\frac{1}{8} = ?$

150. Multiply $\frac{3}{5}$ by $\frac{2}{9}$; $\frac{4}{7}$ by $\frac{5}{16}$; $\frac{3}{8}$ by $\frac{4}{9}$.

151. Multiply $\frac{2}{11}$ by $\frac{3}{5}$; $\frac{7}{15}$ by $\frac{5}{21}$; $\frac{5}{6}$ by $\frac{3}{10}$.

152. Multiply $\frac{7}{8}$ by $\frac{20}{21}$; $1\frac{5}{7}$ by $\frac{8}{35}$; $\frac{7}{9}$ by $\frac{18}{28}$.

153. Multiply $7\frac{1}{2}$ by $8\frac{1}{3}$; $5\frac{1}{4}$ by $6\frac{7}{8}$; $9\frac{1}{3}$ by $12\frac{1}{4}$.

154. Multiply $9\frac{1}{6}$ by $5\frac{1}{2}$; $17\frac{1}{2}$ by $6\frac{7}{10}$; $18\frac{1}{9}$ by $8\frac{1}{3}$.

155. Divide $\frac{4}{7}$ by $\frac{5}{9}$; $\frac{3}{5}$ by $\frac{8}{15}$; $\frac{6}{7}$ by $\frac{5}{14}$; $\frac{7}{9}$ by $\frac{7}{18}$.

156. Divide $\frac{9}{4}$ by $\frac{9}{8}$; $\frac{7}{9}$ by $\frac{8}{27}$; $\frac{6}{5}$ by $\frac{12}{35}$; $\frac{8}{9}$ by $\frac{4}{27}$.

157. If $\frac{1}{5}$ of my property is in real estate, $\frac{3}{4}$ in trade, and the balance, or $8000, is in bank stock, what is the value of my property?

158. Find the value of $17\frac{2}{3}$ boxes of oranges, if $6\frac{1}{3}$ boxes cost $47\frac{1}{2}$.

159. I owed $2000. At one time I paid $246\frac{3}{4}$; at another, $753\frac{1}{2}$; at another, $200\frac{3}{4}$; and again, $600\frac{13}{100}$. How much did I then owe?

160. I buy $7\frac{1}{3}$ yards of silk at $2\frac{1}{2}$ a yard, $14\frac{1}{2}$ yards of velvet at $5 a yard, $16\frac{1}{2}$ yards of cotton at $\frac{1}{12}$ a yard, and 2 yards of ribbon at $\frac{7}{8}$ a yard. I give two $50 bills in payment. How much change ought I to receive?

161. How many yards of cloth at $0.17\frac{2}{3}$ a yard will pay for $75\frac{3}{4}$ bushels of potatoes at $0.58\frac{2}{3}$ a bushel?

162. What will 75 men earn in $18\frac{3}{4}$ days, if each earns $2\frac{2}{15}$ a day.

163. How long will it take a garrison to eat $41\frac{17}{18}$ barrels of flour, if they eat $6\frac{1}{3}$ barrels a week.

Decimals.

164. Multiply 5.13 by 8.75; 15.3 by 7.7.
165. Multiply 17.3 by 19.5; 2.75 by 0.81.
166. Multiply 61.4 by 4.5; 8.7 by 19.3.
167. Multiply 18.6 by 3.4; 7.17 by 18.5.
168. Multiply 75.3 by 9.15; 81.5 by 21.7.
169. Multiply 16.8 by 13; 44.4 by 33.3.
170. Divide 18.5 by 8.5; 105 by 0.7; 117 by 0.03
171. Divide 71.6 by 0.4; 64.8 by 0.09.
172. Divide 84.7 by 0.007; 47.6 by 1.4.
173. Divide 165 by 0.015; 88.2 by 0.014.
174. Divide 0.017 by 25; 0.04 by 16.

Compound Numbers.

175. How many square feet in a quarter of an acre?

176. How many square feet in the sides of a room 18 feet long, 15 feet wide, and 8 feet 6 inches high?

177. What will it cost for the carpet for a room 21 feet long and 15 feet wide, if half a yard in all is allowed for turning under, and the carpet is a yard wide and costs $1.15 a yard?

178. How many minutes are there in the month of February, 1900?

179. What will 1 275 pounds of hay cost at $13.50 a ton?

180. If a family use 3 quarts and a pint of milk a day, how many quarts will they use in the quarter ending November 30?

181. How many feet board measure are there in a plank 16 feet long, 16 inches wide, and $2\frac{1}{4}$ inches thick?

182. How many feet board measure are there in 24 joists each 18 feet long and 3 by 4 inches in the other dimensions?

183. How many feet board measure in a board 17 feet long, 11 inches wide, and $\frac{3}{4}$ of an inch thick?

184. A rectangular room 22 feet long is covered by 44 square yards of carpet. How wide is the room?

185. How many square feet of surface on the outside of a box 4 feet long, 3 feet wide, and 2 feet high?

186. How many cords of wood in a pile 45 feet long, 4 feet wide, and 6 feet deep?

187. At $5.50 a cord, what will 25 cords and 3 cord feet of wood cost?

188. How many rods in $\frac{1}{16}$ of a mile?

189. How many bushels of grain will a bin 10 ft. 6 in. long by 3 ft. 6 in. wide and 5 ft. high hold? (One bushel = 2150.4 cubic inches.)

190. A room 18 ft. long, 13 ft. wide, and 8 ft. high has three doors, each 7 ft. by 3 ft., two windows, each 5 ft. by 2 ft. 6 in., and the base-board is a foot wide. How many square yards are there to be plastered in the side walls?

191. How many cubic yards of gravel can be carried on a train of 13 cars, the box on each car being 14 ft. long, 6 ft. 6 in. wide, 3 ft. 3 in. high?

192. At \$37.50 an acre, what will 45 acres 25 square rods of land cost?

193. How many square yards in the walls of a room 15 ft. long, 12 ft. wide, and 7 ft. high?

194. If the room named in Ex. 193 has two doors 7 ft. by $3\frac{1}{2}$ ft., two windows 5 ft. by 3 ft., and a base-board 10 inches wide, what will it cost, at \$0.25 a square yard, to plaster the room?

195. If in a shower the water falls to the depth of half an inch, how many gallons, each 231 cubic inches, fall on an acre?

196. What must I pay for 16 joists, 15 ft. long, 4 inches by 3 inches in the other dimensions, at a cent a board foot?

197. At \$6.25 a cord, what will 15 cords and 3 cord feet of wood cost?

198. How deep is a cellar 45 ft. long and 33 ft. wide, if 275 cubic yards of earth are removed in digging it?

199. If I buy $\frac{3}{4}$ of an acre of land, and sell 18335 square feet, how many square feet have I left?

200. How many cubic feet in a rectangular block of marble 5 ft. long, $3\frac{1}{2}$ ft. wide, and 9 in. thick?

201. If I pay $2.50 for 1 bu. 1 pk. 1 qt. 1 pt. of berries, for how much must I sell them a quart to gain $1.65.

202. A lot of land containing 2 acres 45 square rods can be divided into how many lots of 73 square rods each?

203. How many bottles, each holding ½ pt., will it take to hold 67 gal. 2 qt. 1 pt. of vinegar?

204. How many pounds of rice at 4 cents a pound must be given for 4 bushels 3 pecks of chestnuts at $2.00 a bushel?

205. How many bricks 8 in. by 4 in. by 2 in. will it take to cover a walk 10 ft. 8 in. long by 6 ft. 8 in. wide, if the bricks are laid with the 8 in. by 4 in. face up?

206. If the bricks are laid in the walk named in Ex. 205 with the 8 in. by 2 in. face up, how many bricks will it take? What is the increase in the cost if the bricks are $10 a thousand?

207. What is a pile of 4-foot wood 50 ft. long and 6 ft. high worth at $5.50 a cord?

208. What must be paid for 12 boards 15 ft. long, 1 ft. 6 in. wide, ½ in. thick, at 15 cts. a board foot?

209. There are two bins whose dimensions are, one $6 \times 5 \times 4$ ft., and the other equals a cube $5 \times 5 \times 5$ ft. Which holds the more, and how many bushels more?

210. Find the cost of a rectangular lot of land $5\frac{1}{2}$ rd. by $6\frac{1}{4}$ rd., at $0.25 a square foot.

211. Find the exact number of days from May 17, 4 P. M., to September 14, 7 A. M.

212. Find the exact number of days from December 28, 9 A. M., to February 21, 5 P. M.

213. Find the exact number of days from May 17, 3 P. M., to September 13, 9 A. M.

Percentage.

214. What is 17 % of $841?

215. A man whose annual income is $2533 spends 67 % of it. How much does he save?

216. Find 9% of $1355. Of $844. Of $2781.

217. Find 13 % of $455. 15 %. 23 %. 18 %.

218. How must I sell velvet that cost $1.35 a yard, so as to have a profit of 12 %? 10 %? 16⅔ %? 25 %? 33⅓ %? 50 %?

219. If a man buys a horse for $175, and sells it so as to gain 15 %, what does he receive for it?

220. If 10 % deduction is made on a bill of $125.30, what is left to be paid?

221. If flour costs $5.25 a barrel, and is sold at an advance of 8 %, what profit is made on a barrel?

222. A salesman receives 4 % commission for selling goods. What is his commission on a sale of $648.45 worth?

223. What per cent of $280 is $36.40?

224. What per cent of $575 is $120.75?

225. Mr. Martin earns $896 a year and spends $600.32. What per cent does he save?

226. On a bill of $137.50 only $52.25 was collected. What per cent of the bill remains uncollected?

227. John Moore bought a pair of horses for $495, and sold them for $569.25. What per cent did he gain?

228. In a school of 380 pupils, 19, on an average, were absent every day. What was the per cent of attendance?

229. $64.35 is 9 % of what sum?

230. $18.75 is 15 % of what sum?

231. After a loss of 23 % of my property, I still have left $1046.50. What did I have before the loss?

232. What is the balance of a bill of $64.50 after a deduction of 20 %, and then a deduction of 5 % on what remained?

233. I bought a store for a certain sum, and after paying a tax of 2½ % on the cost, and ½ % more for insurance, I sold it for $7 828, which exactly covered the cost, tax, and insurance. What was the cost?

234. In ten years a certain town gained in population 15 %. At the end of the time it had 3 473 inhabitants. What was the number at the beginning of the ten years?

235. What is 25 % of 87½ % of 100 % of 2372?

236. If a regiment of 900 lost 8 % in battle, and 25 % of the remainder by sickness, how many were left?

237. Of 160 yards 128 were sold. What per cent remained?

238. What per cent of $\frac{5}{6}$ of $\frac{8}{15}$ is $\frac{2}{3}$ of ½?

239. What per cent of 102 gallons and 2 quarts is 20 gallons and 2 quarts?

240. A man's income is $2145, which is 15 % of the value of all his property. What is the value of his property?

241. 16¼ is 8 % of what number?

242. If Mr. Hallowell sells a house for $322, and so loses 8 %, what should he sell it for to gain 15 %?

243. If I buy a horse for $340, then pay $60 for keeping it, and sell it for $540, what per cent do I gain?

244. If I lose 15 % by selling my farm for $1700, what must I get to gain 15 %?

245. If I make 16⅔ % by selling nuts at 14 cents a pound, for what must I sell them to make 20 %?

246. What sum must be invested at 5½ % to yield an annual income of $772.20?

Interest.

Find the interest with the

	Principal.	Time.	Rate.
247.	$740	2 y. 2 m.	6 %.
248.	$27.40	5 y. 3 m.	5 %.
249.	$18.50	3 y. 5 m.	5½ %.
250.	$287.25	4 y. 4 m. 4 d.	6 %.
251.	$756.15	8 m. 17 d.	6 %.
252.	$1 254	5 y. 5 m. 5 d.	5 %.
253.	$876.04	6 m. 11 d.	6½ %.
254.	$743.21	4 m. 17 d.	8 %.
255.	$45.14	1 y. 3 m. 19 d.	7 %.
256.	$114.25	2 y. 3 m. 12 d.	6 %.
257.	$47.95	3 y. 3 m. 3 d.	5 %.
258.	$721.13	5 y. 7 m. 9 d.	5½ %.

Find the amount with the

	Principal.	Time.	Rate.
259.	$321	5 m. 25 d.	6 %.
260.	$217.50	4 m. 5 d.	6 %.
261.	$37.45	2 y. 2 m. 2 d.	5 %.
262.	$407.08	1 y. 2 m. 3 d.	5½ %.
263.	$1 237	3 y. 4 m. 5 d.	6½ %.
264.	$75.35	1 y. 9 m. 17 d.	6 %.
265.	$144.10	2 y. 3 m. 4 d.	5 %.
266.	$653.87	4 y. 4 m. 4 d.	5½ %.
267.	$847.30	1 y. 5 m. 10 d.	6 %.
268.	$49.54	3 y. 7 m. 5 d.	4 %.
269.	$18.75	2 y. 8 m. 4 d.	4½ %.
270.	$433.18	5 y. 4 m. 8 d.	3½ %.
271.	$875.50	2 y. 3 m. 7 d.	5 %.
272.	$345.37	3 y. 2 m. 2 d.	5½ %.
273.	$483.04	1 y. 3 m. 8 d.	6 %.
274.	$515.75	4 y. 4 m. 4 d.	4 %.

Find the interest with the

	Principal.	Time.	Rate.
275.	$84.65	March 14 to Sept. 1	6 %.
276.	$71.29	April 11 to Aug. 4	5 %.
277.	$154.18	Jan. 4 to June 3	5½ %.
278.	$2175	May 17 to Sept. 15	6 %.
279.	$414.13	Sept. 15 to Dec. 12	4 %.
280.	$343.81	July 5 to Oct. 18	5 %.
281.	$217.54	June 27 to Nov. 3	4½ %.
282.	$143.35	Aug. 10 to Dec. 4	7 %.
283.	$89.10	Feb. 18 to June 17	6½ %.
284.	$114.25	Oct. 25 to Dec. 8	6 %.
285.	$744.05	Nov. 30 to Dec. 17	5 %.
286.	$815.37	July 17 to Oct. 14	4 %.

Find the amount with the

	Principal.	Time.	Rate.
287.	$784.43	March 6 to July 3	6 %.
288.	$561.28	Feb. 19 to Aug. 7	5 %.
289.	$258.75	May 27 to Oct. 3	6½ %.
290.	$135.49	April 30 to Aug 13	5½ %.
291.	$1 287	Jan. 25 to June 5	5 %.
292.	$84.75	June 23 to Sept. 4	6 %.
293.	$1738	July 16 to Oct. 1	4 %.
294.	$187.13	Sept. 19 to Dec. 8	4½ %.
295.	$2764	Aug. 28 to Nov. 6	5 %.
296.	$44.55	May 5 to Sept. 19	7 %.

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